US009089457B2

(12) United States Patent
Kawakami et al.

(10) Patent No.: US 9,089,457 B2
(45) Date of Patent: Jul. 28, 2015

(54) **BODILY FLUID ABSORBENT ARTICLE**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 138 days.

(21) Appl. No.: **13/819,728**

(22) PCT Filed: **Sep. 16, 2011**

(86) PCT No.: **PCT/JP2011/005267**
§ 371 (c)(1), (2), (4) Date: **Feb. 28, 2013**

(87) PCT Pub. No.: **WO2012/035787**
PCT Pub. Date: **Mar. 22, 2012**

(65) **Prior Publication Data**

US 2013/0165882 A1 Jun. 27, 2013

(30) **Foreign Application Priority Data**

Sep. 16, 2010 (JP) 2010-208654
Feb. 16, 2011 (JP) 2011-031405

(51) **Int. Cl.**
A61F 13/15 (2006.01)
A61F 13/537 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC ***A61F 13/53717*** (2013.01); ***A61F 13/4756*** (2013.01); ***A61F 13/47218*** (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC A61F 13/49001; A61F 13/4756; A61F 13/4704; A61F 13/47218; A61F 13/533; A61F 13/534; A61F 13/535; A61F 13/536; A61F 13/538; A61F 2013/4587; A61F 2013/53016; A61F 2013/530175; A61F 2013/5315; A61F 2013/53445; A61F 2013/53472; A61F 2013/5349; A61F 2013/5355; A61F 2013/5383
USPC 604/368, 374, 375, 380
See application file for complete search history.

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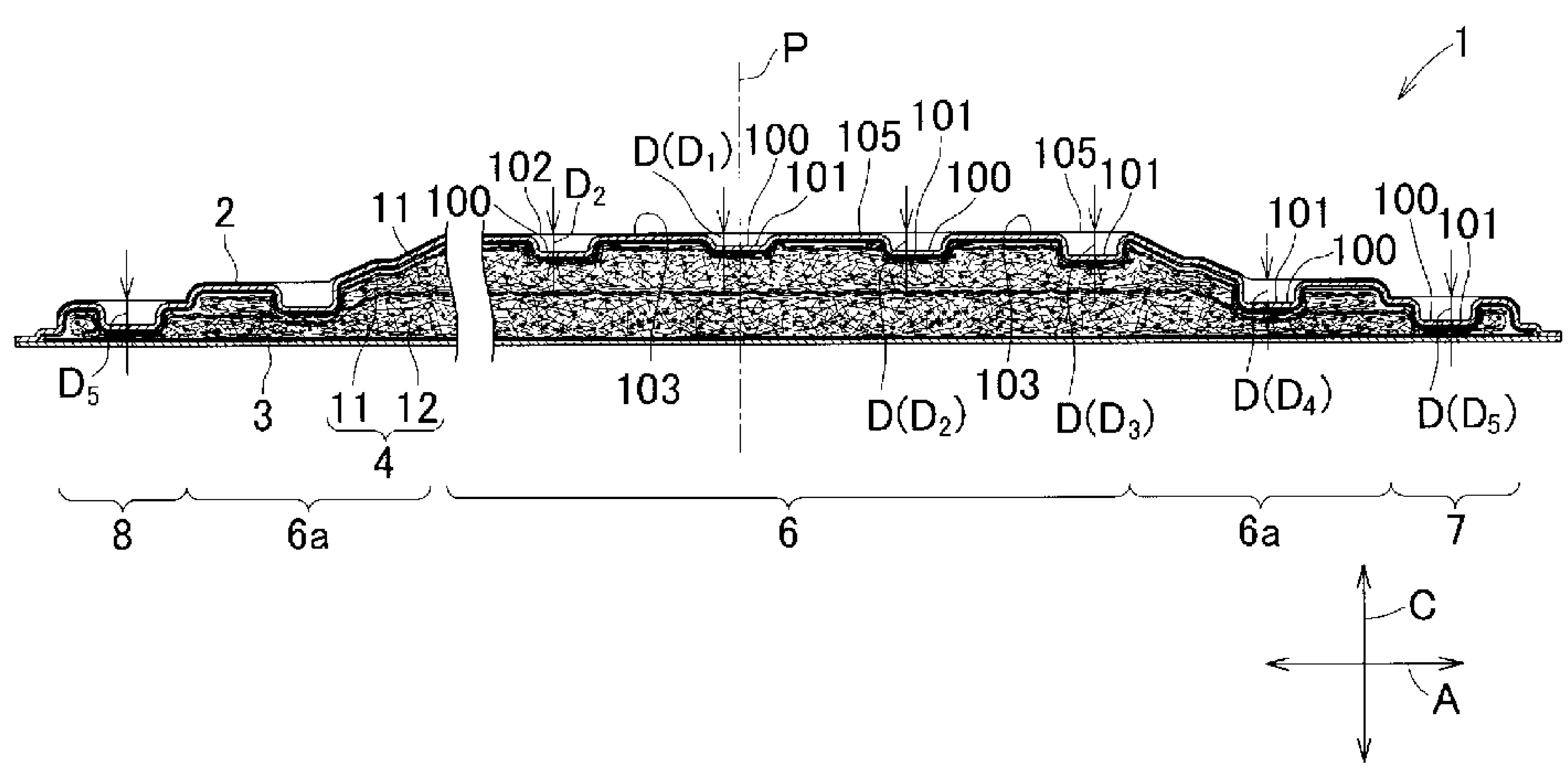
(57) **ABSTRACT**

A bodily fluid absorbent article adapted to absorb bodily fluid over a wide range thereof. An absorbent structure in the bodily fluid absorbent article includes an upper absorbent component and a lower absorbent component. The absorbent structure further includes one of a dispersing surface constituting the upper absorbent component and kept in contact with the lower absorbent component and a dispersing surface constituting the lower absorbent component and kept in contact with the upper absorbent component. Such dispersing surface exhibits a dispersion velocity for bodily fluid higher than those exhibited by the absorbent sections defined immediately above and under this dispersing surface.

5 Claims, 10 Drawing Sheets



(51) **Int. Cl.**

A61F 13/538	(2006.01)
A61F 13/475	(2006.01)
A61F 13/472	(2006.01)
A61F 13/535	(2006.01)
A61F 13/45	(2006.01)
A61F 13/534	(2006.01)
A61F 13/53	(2006.01)

(52) **U.S. Cl.**

CPC ***A61F13/535*** (2013.01); ***A61F 13/538*** (2013.01); *A61F 13/534* (2013.01); *A61F 2013/15406* (2013.01); *A61F 2013/15439* (2013.01); *A61F 2013/4587* (2013.01); *A61F 2013/5307* (2013.01); *A61F 2013/53445* (2013.01); *A61F 2013/53734* (2013.01); *A61F 2013/53739* (2013.01); *A61F 2013/53778* (2013.01)

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Fig. 1

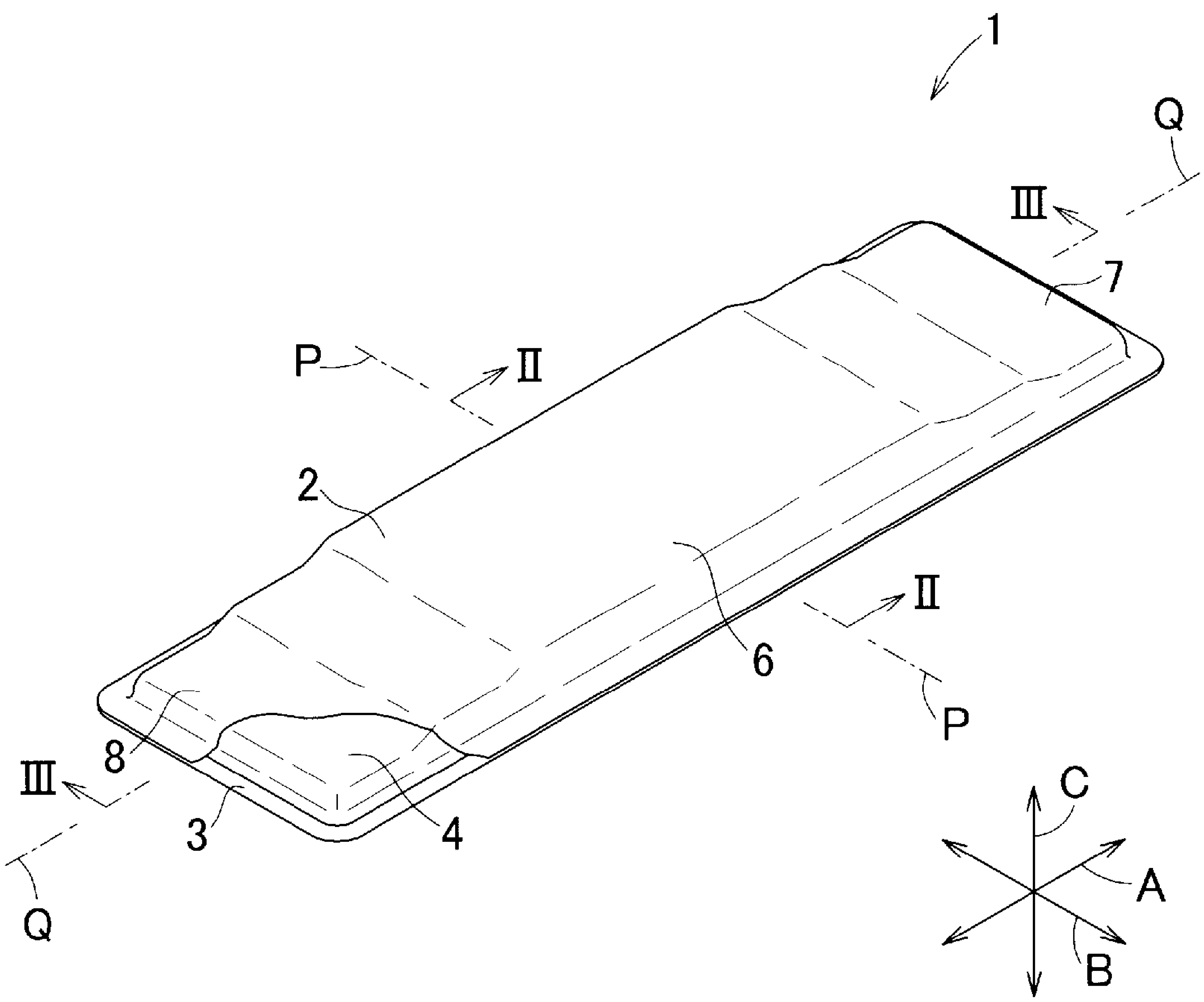
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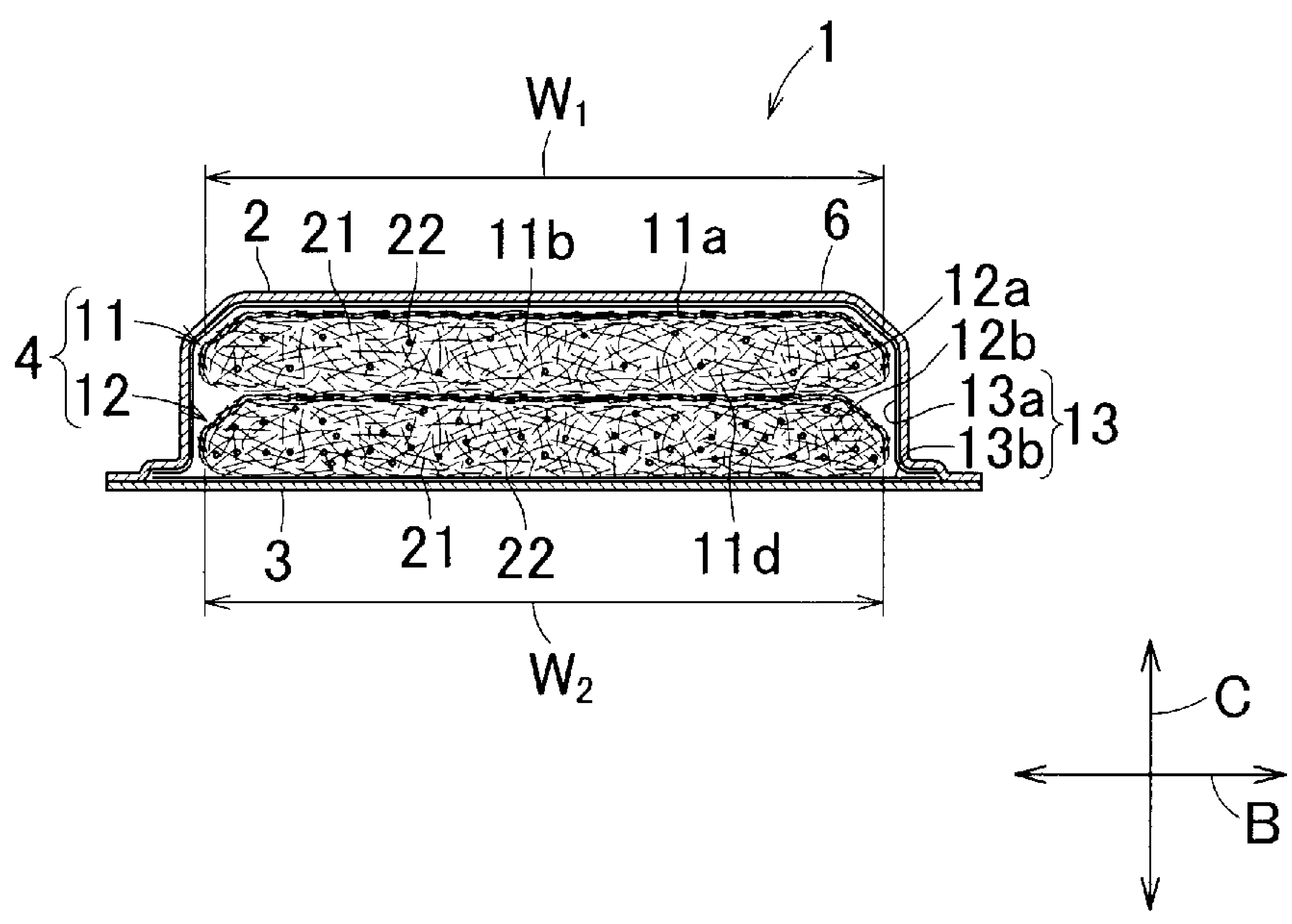
Fig. 2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12
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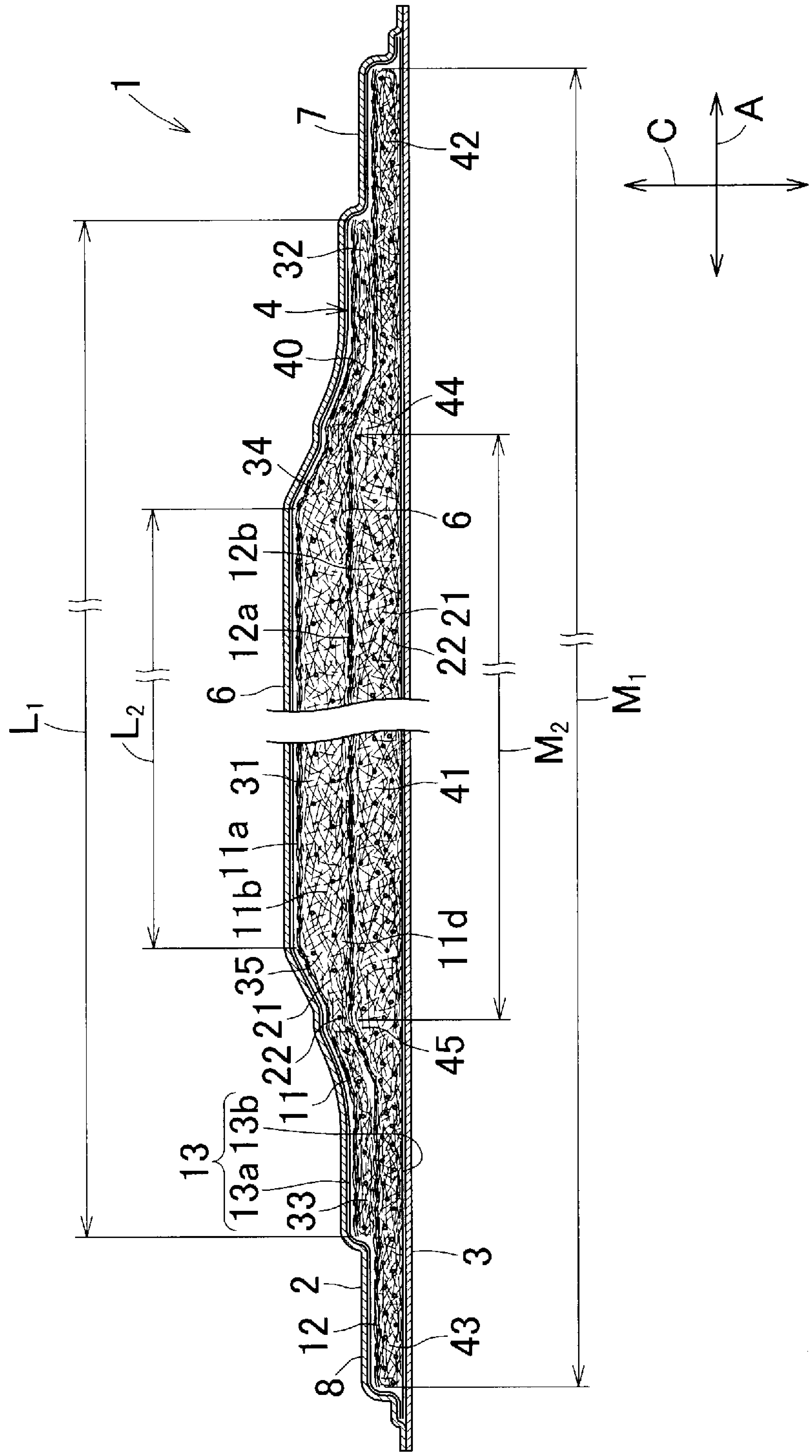
3 21 22 11d
W_2
C
B

Fig. 3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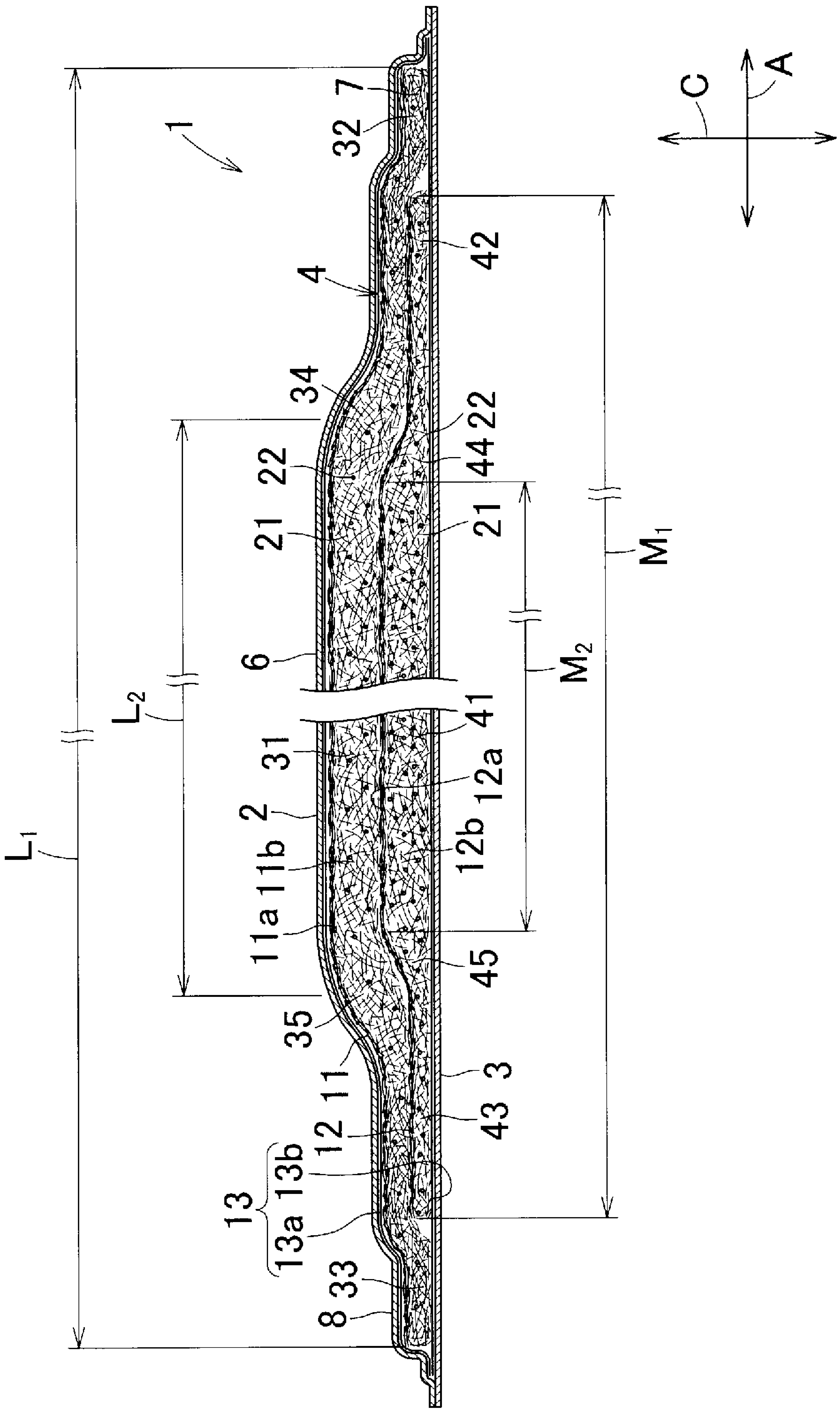
13b
11
33
3
2
12
43
8

Fig. 4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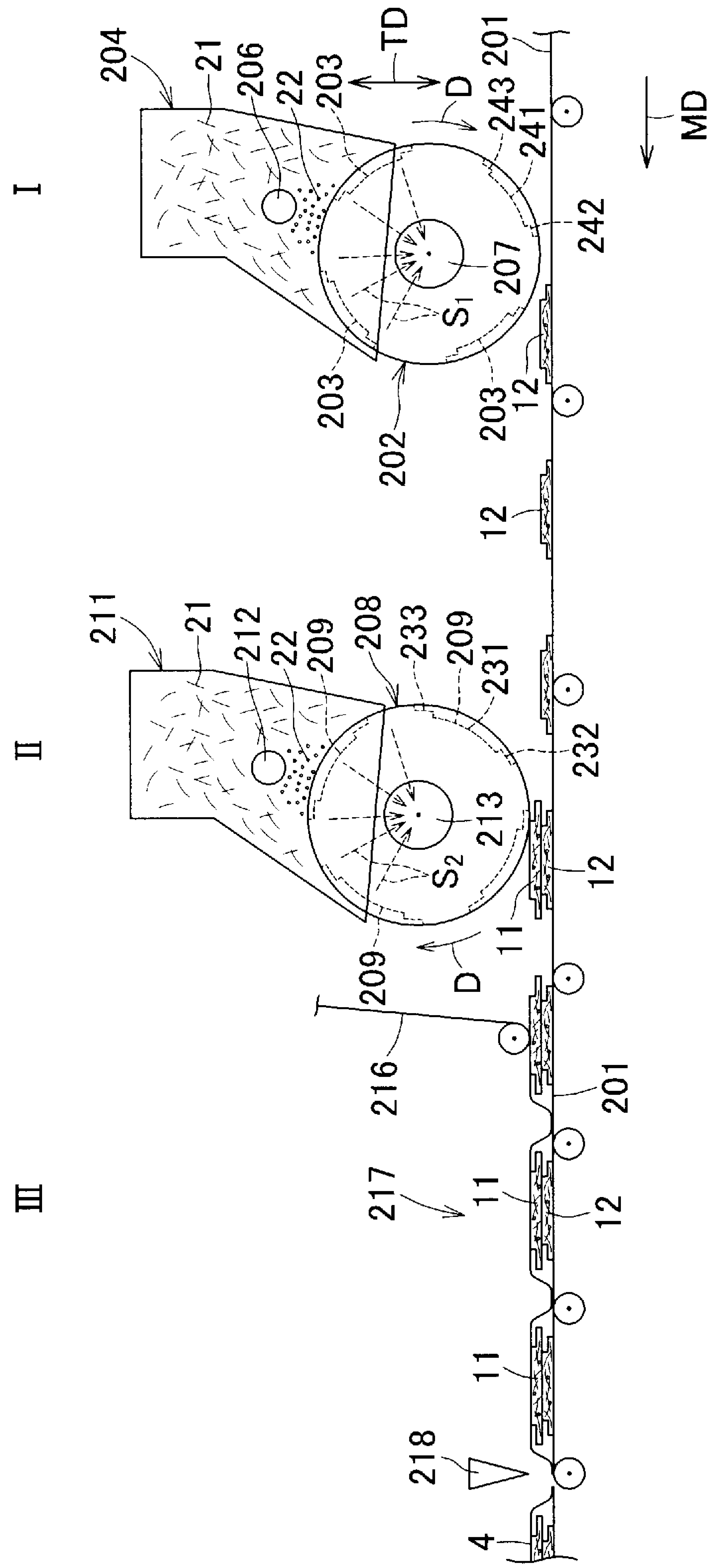
33
8
C
A

Fig. 5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S_2
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218
4

Fig. 6

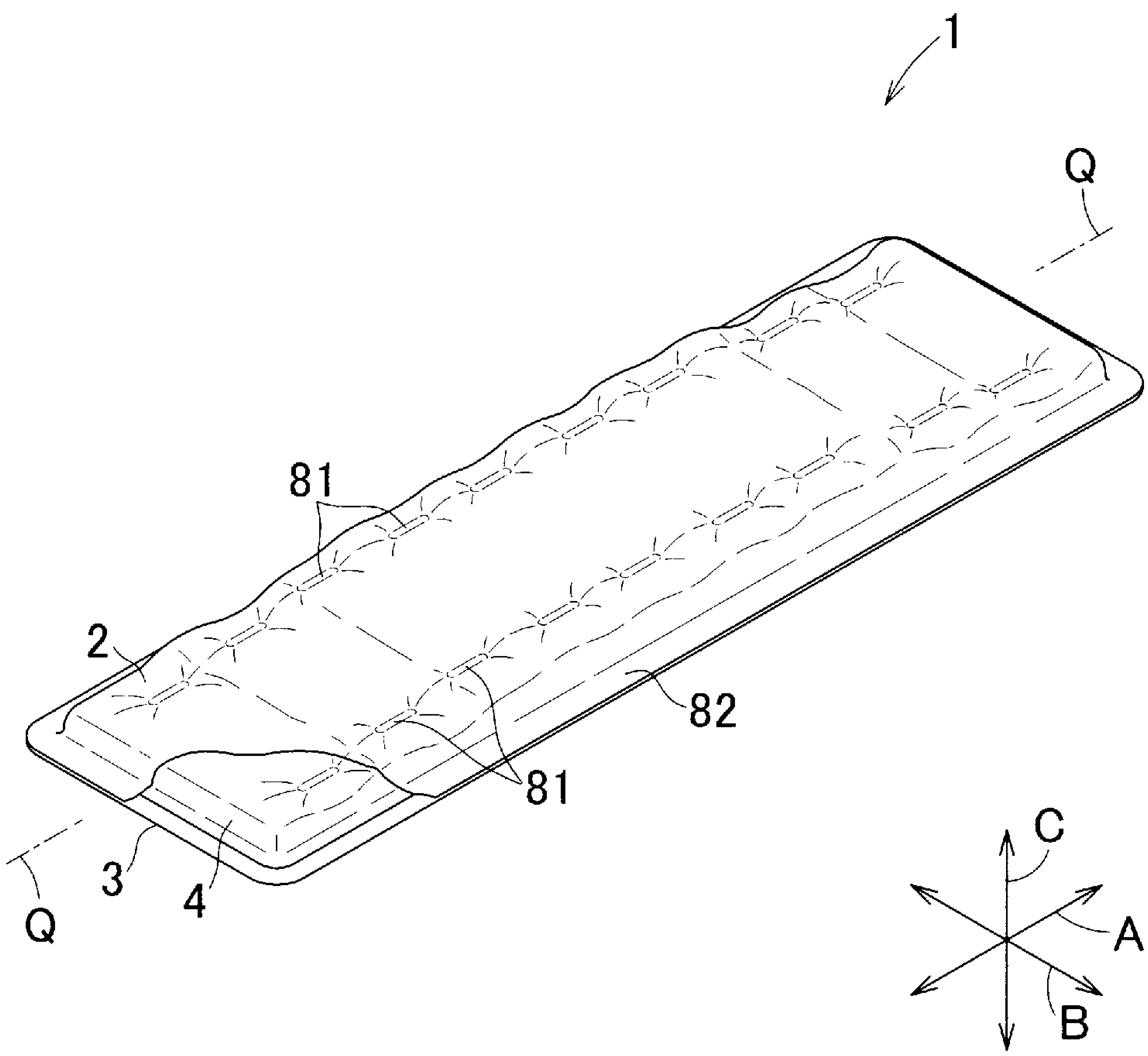


Fig. 7

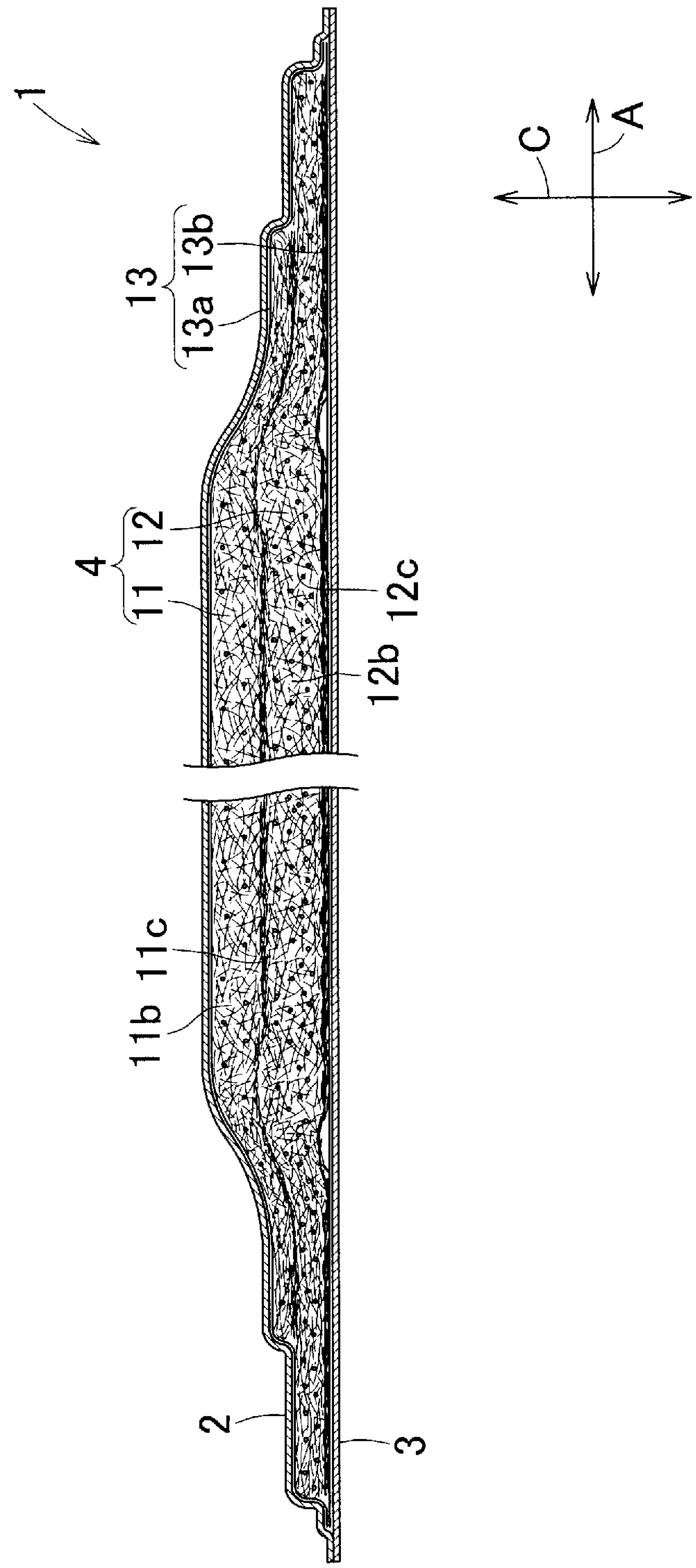


Fig. 8

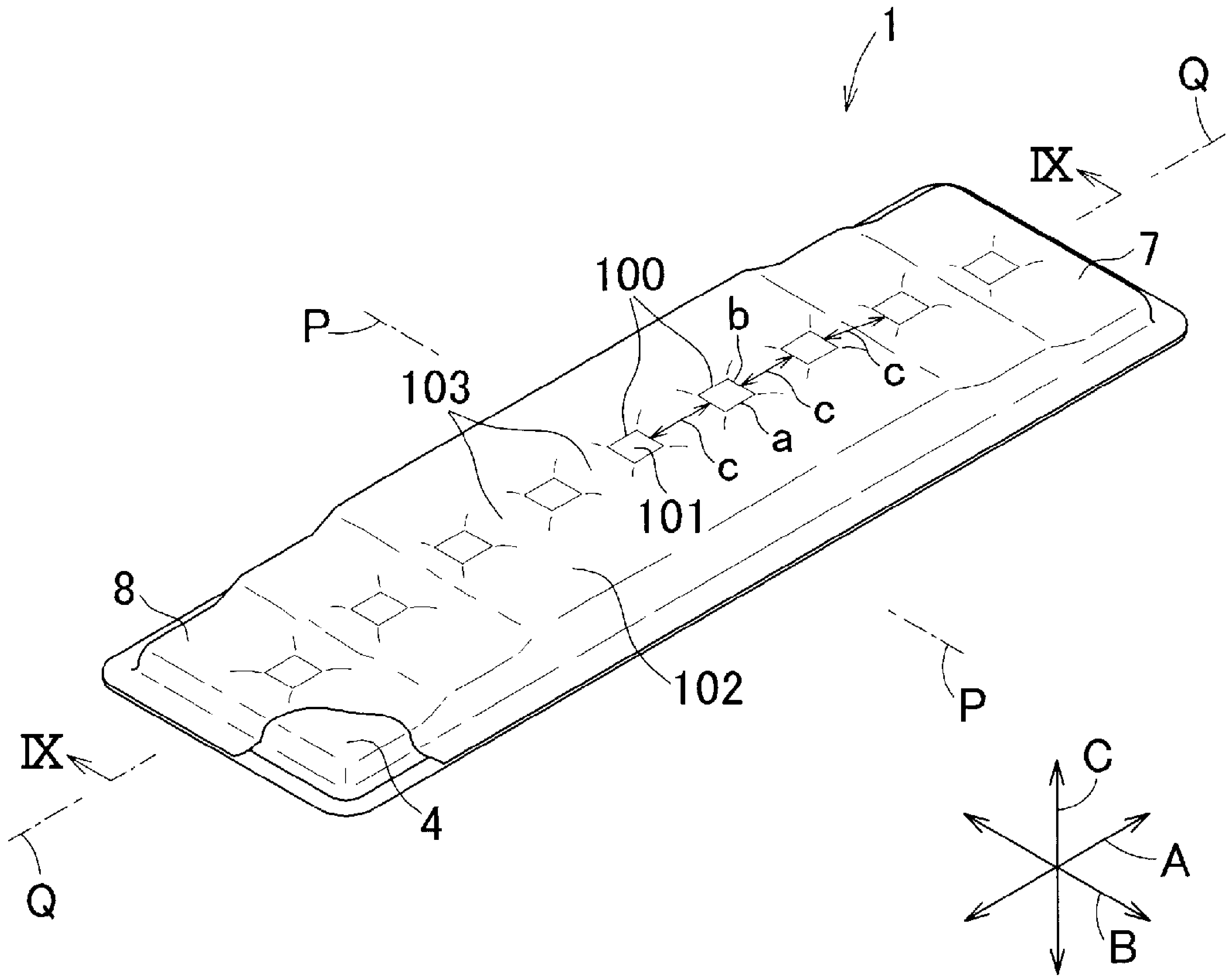
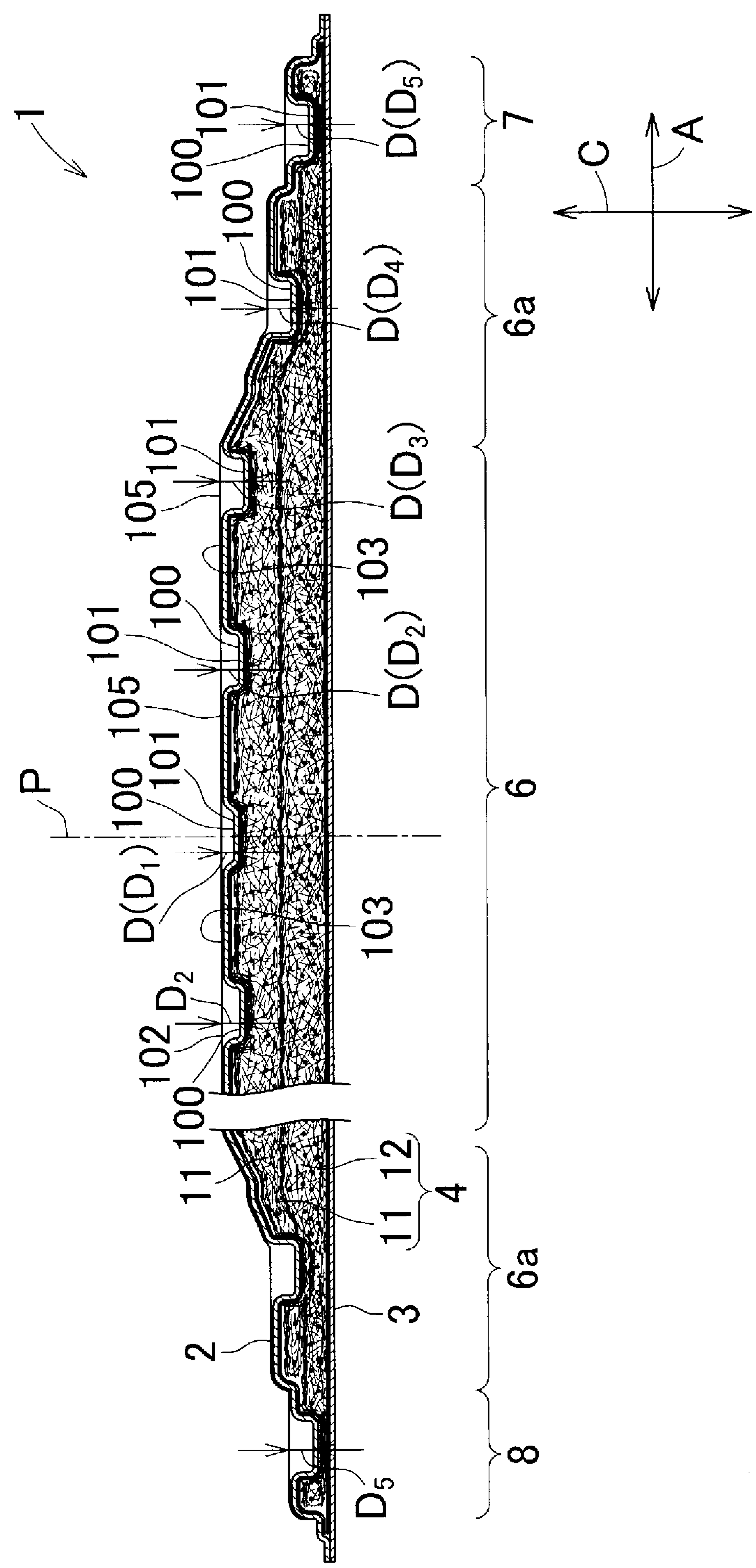


Fig. 9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D(D2)
105
P
100
101
D(D1)
6
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D2
102
100
100
11
12
11
4
6a
2
3
D5
8

Fig. 10

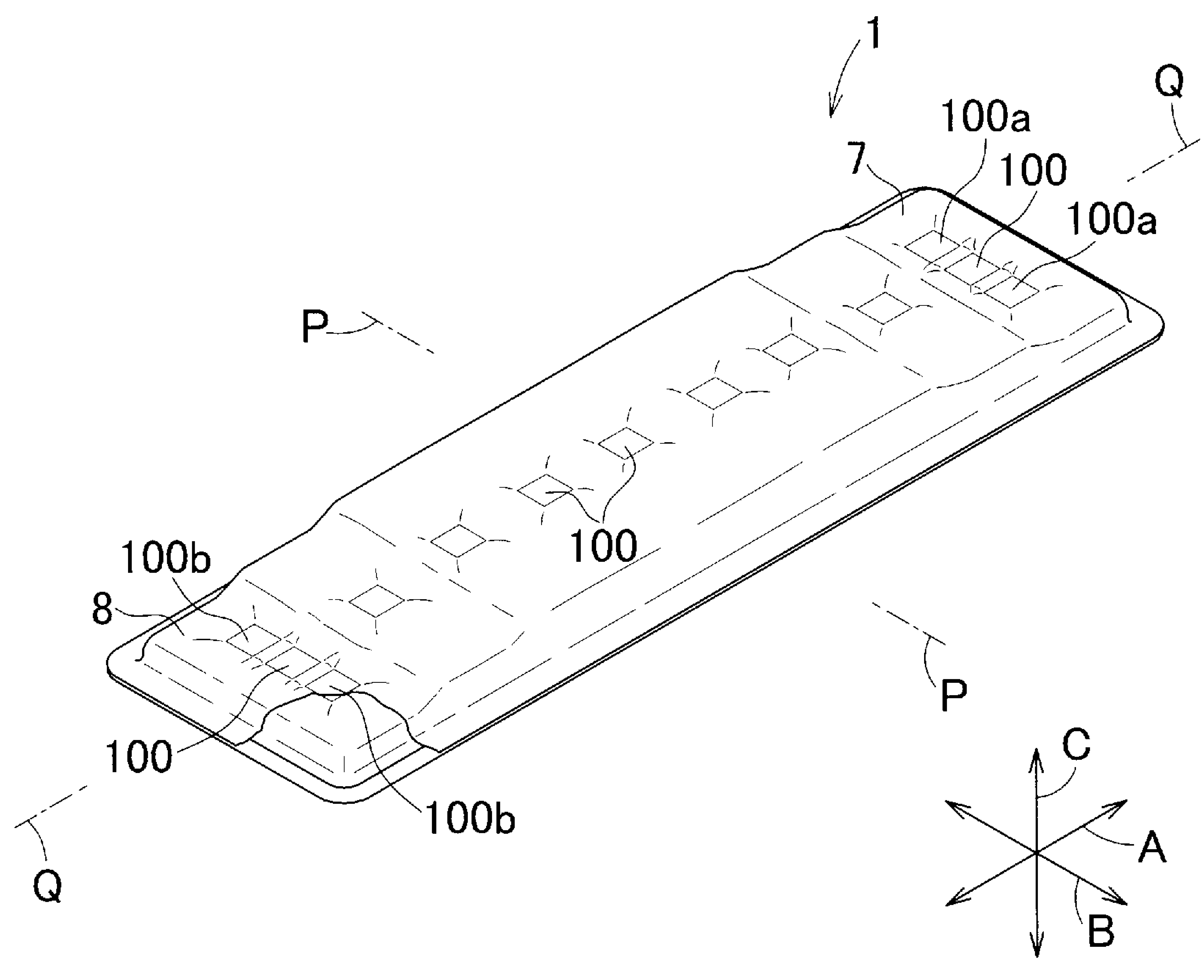
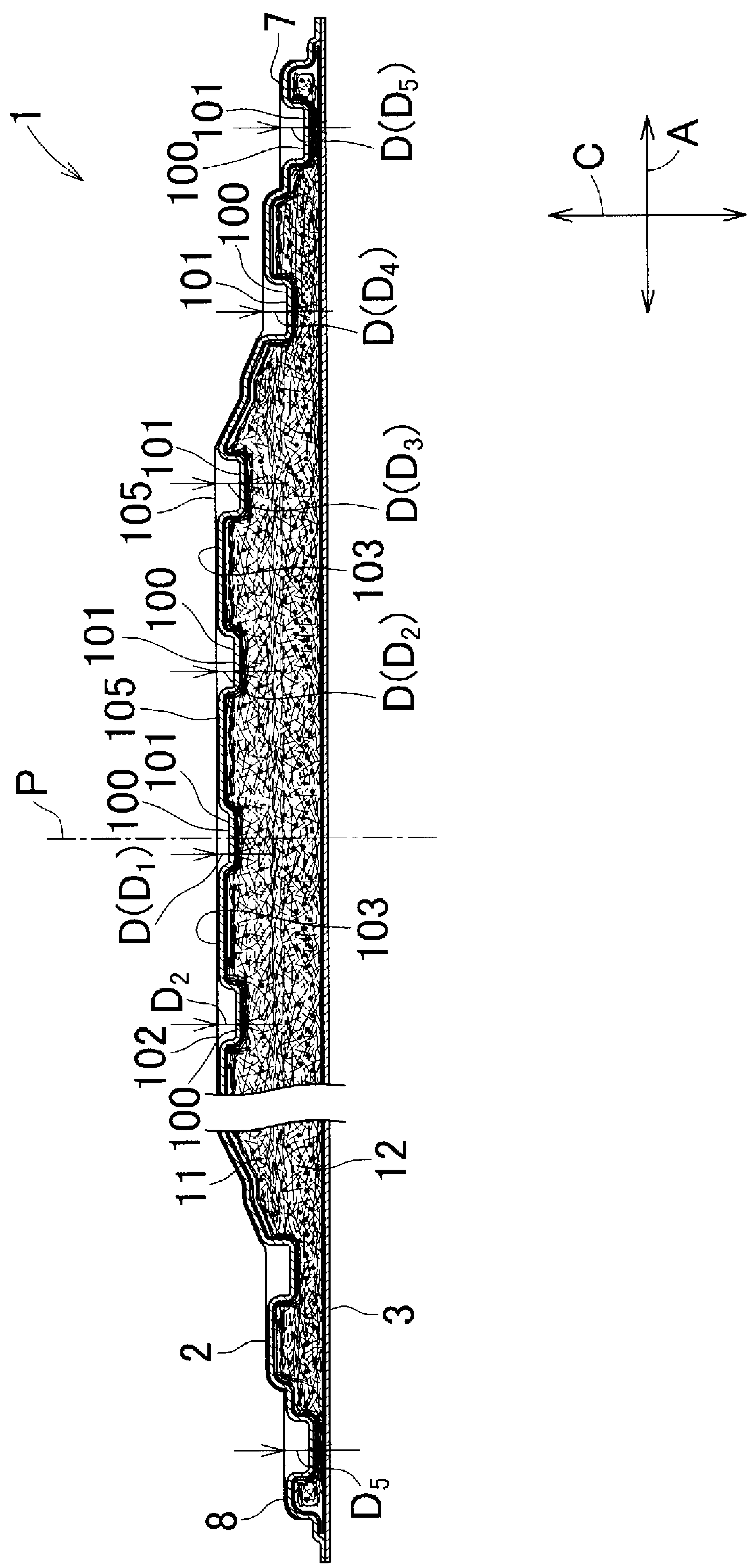


Fig. 11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P
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101
D(D1)
103
D2
102
100
11
12
2
3
8
D5
C
A

BODILY FLUID ABSORBENT ARTICLE

RELATED APPLICATION

This application is a 35 U.S.C. §371 national phase filing of International Patent Application No. PCT/JP2011/005267, filed Sep. 16, 2011, through which and to which priority is claimed under 35 U.S.C. §119 to Japanese Patent Application Nos. 2010-208654, filed Sep. 16, 2010 and 2011-031405filed Feb. 16, 2011.

TECHNICAL FIELD

The present disclosure relates to bodily fluid absorbent articles adapted to be used as urine absorbent pads, sanitary napkins or the like.

BACKGROUND ART

Conventionally, a menstruation pad as one example of bodily fluid absorbent articles is well known and a menstruation pad including a centrally convex absorbent structure is also well known.

For example, the absorbent article disclosed in JP 2002-238948 A (PTL 1) is exemplarily described on the basis of a sanitary napkin wherein the absorbent structure includes an upper absorbent component and a lower absorbent component shaped to be smaller than the upper absorbent component and on which the upper absorbent component is layered. This sanitary napkin is provided on its side facing the wearer's skin with the centrally convex absorbent region.

The absorbent article disclosed in JP 2008-6203 A (PTL 2) is exemplarily described on the basis of a sanitary napkin wherein the absorbent structure includes a first centrally convex layer and a second centrally convex layer. The first centrally convex layer defines a region of the absorbent structure being thicker than its periphery and the second centrally convex layer defines the region layered on the first centrally convex layer and is thicker than the first centrally convex layer. This absorbent structure is formed by locally compressing a lower absorbent component and layering an upper absorbent component on the compressed region of the lower absorbent component. The lower absorbent component defines the first centrally convex layer and the lower absorbent component cooperates with the upper absorbent component layered thereon to define the second centrally convex region.

CITATION LIST

Patent Literature

{PTL 1} JP 2002-238948 A
{PTL 2} JP 2008-6203 A

SUMMARY OF INVENTION

Technical Problem

The bodily fluid absorbent article, such as the sanitary napkin, having the bodily fluid absorbent structure provided with the centrally convex region facilitates the centrally convex region to be kept in close contact with the wearer's bodily fluid excretory organ, assuring that the centrally convex region can collect bodily fluid in a concentrated manner. However, the centrally convex component is usually formed of a mass or an aggregation of liquid-absorbent fibers or mixture of the liquid-absorbent fibers and super-absorbent polymer particles and the bodily fluid having been once collected by the centrally convex component cannot smoothly disperse into the periphery of the centrally convex region. In consequence, it is impossible for the bodily fluid absorbent article to absorb bodily fluid completely and the wearer may often experience a significant feeling of wetness.

An object of the present invention is to improve the bodily fluid absorbent article of known art so that the wearer's bodily fluid can be absorbed over a wide range of the absorbent structure even when the absorbent structure includes the centrally convex region.

Solution to Problem

The present invention has first, second and third aspects. According to the first, second and third aspects of the present invention, respectively, there is provided a bodily fluid absorbent article having a longitudinal direction and a thickness direction and comprising a liquid-pervious topsheet, a liquid-pervious or liquid-impervious backsheet and an absorbent structure sandwiched between the top- and backsheets as viewed in the thickness direction. The absorbent structure includes amass or an aggregation of liquid-absorbent materials at least including liquid-absorbent fibers and wrapped with one or more wrapping sheets, and a dispersing surface facilitating bodily fluid to be dispersed, and wherein at least a portion of one of the wrapping sheets located above as viewed in the thickness direction is liquid-pervious.

The present invention according to the first aspect thereof further includes the absorbent structure including an upper absorbent component and a lower absorbent component both lying inside the one or more wrapping sheets and layered one on another in the thickness direction and the dispersing surface of the upper absorbent component which is kept in contact with the lower absorbent component or a dispersing surface of the lower absorbent component which is kept in contact with the upper absorbent component; and the liquid-absorbent fibers in the dispersing surface extending along the dispersing surface. Preferably, the orientation of the liquid-absorbent fibers in the longitudinal direction or the transverse direction, respectively, is higher in the dispersing surface than in a region of the respective absorbent component contacting the dispersing surface.

The second aspect thereof further includes the dispersing surface including a plurality of compressed regions formed by locally compressing the absorbent component in the thickness direction so as to be arranged intermittently in the longitudinal direction so that the compressed regions having respective areas gradually enlarging from a central region of the bodily fluid absorbent article toward opposite end regions in the longitudinal direction.

The third aspect thereof further includes the dispersing surface including a plurality of compressed regions formed by locally compressing the absorbent component in the thickness direction so as to be arranged intermittently in the longitudinal direction so that the compressed regions having respective densities gradually increasing from a central region of the bodily fluid absorbent article toward opposite end regions in the longitudinal direction.

Advantageous Effects of Invention

In the bodily fluid absorbent article according to the first aspect of the present invention, the absorbent structure includes one of the dispersing surface constituting the upper absorbent component and kept in contact with the lower absorbent component and the dispersing surface constituting the lower absorbent component and kept in contact with the upper absorbent component. The dispersion velocity of bodily fluid is higher in any one of the dispersing surface than in the region lying immediately above this dispersing surface and in the region lying immediately under this dispersing surface. When bodily fluid having been absorbed by the upper absorbent component moves down to the lower absorbent component and reaches this dispersing surface, bodily fluid disperses over this dispersing surface in the longitudinal direction and/or in the transverse direction of the bodily fluid absorbent article and simultaneously moves toward the lower absorbent component. In consequence, the absorbent structure can absorb and contain bodily fluid over a wide range including, for example, the opposite end regions in the longitudinal direction thereof.

The bodily fluid absorbent article according to the second aspect of the present invention includes the compressed regions arranged intermittently in the longitudinal direction of the bodily fluid absorbent article as the bodily fluid-dispersing means. The respective compressed regions having the areas gradually enlarging from the central region toward the end regions so that bodily fluid discharged onto the central region moves from the non-compressed region of relatively low density toward the respective compressed regions and then disperses toward the compressed regions formed in the end regions and each having a relatively large area. Consequently, bodily fluid can be absorbed over a wide range inclusive of the end regions of the absorbent structure.

One or more embodiments according to the third aspect of the present invention includes the compressed regions arranged intermittently in the longitudinal direction of the bodily fluid absorbent article. The compressed regions respectively have the densities gradually increasing from the central region toward the end regions. With such arrangement, bodily fluid discharged onto the central region moves from the non-compressed region having a relatively low density toward the compressed regions and this bodily fluid disperses toward the compressed regions formed in the end regions and having further higher density. In consequence, bodily fluid can be absorbed over a wide range inclusive of the end regions of the absorbent structure.

BRIEF DESCRIPTION OF DRAWINGS

{FIG. **1**}

A partially cutaway perspective view of a bodily fluid absorbent article (urine absorbent pad).

{FIG. **2**}

A sectional view taken along line II-II in FIG. **1**.

{FIG. **3**}A sectional view taken along line III-III in FIG. **1**.

{FIG. **4**}

A view similar to FIG. **3**, showing one embodiment of the present invention.

{FIG. **5**}

A diagram exemplarily illustrating a process of making the bodily fluid absorbent article.

{FIG. **6**}

A view similar to FIG. **1**, showing another embodiment of the present invention.

{FIG. **7**}

A view similar to FIG. **3**, showing still another embodiment of the present invention.

{FIG. **8**}

A view similar to FIG. **1**, showing yet another embodiment of the present invention.

{FIG. **9**}

A sectional view taken along line IX-IX in FIG. **8**.

{FIG. **10**}

A view similar to FIG. **8**, showing further another embodiment of the present invention.

{FIG. **11**}

A view similar to FIG. **9**, showing an alternative embodiment of the present invention.

DESCRIPTION OF EMBODIMENTS

Details of a bodily fluid absorbent article according to the present invention will be more fully understood from the description of a urine absorbent pad, one or more embodiments of such an article are given hereunder with reference to the accompanying drawings.

Referring to FIG. **1**, a urine absorbent pad **1** has a longitudinal direction A, a transverse direction B and a thickness direction C and includes a liquid-pervious topsheet **2**, a liquid-impervious backsheet **3** and a bodily fluid absorbent structure **4** sandwiched between the top- and backsheets **2**, **3** in descending order as viewed in the longitudinal direction A. The backsheet **3** may alternatively be liquid pervious. Both the topsheet **2** and the backsheet **3** preferably extend outward beyond a peripheral edge of the absorbent structure **4**, as shown, so as to overlap one another and these are preferably bonded together with hot melt adhesives (not shown), or otherwise, outside the peripheral edge. The pad **1** is preferably generally rectangular and the absorbent structure **4** is also preferably generally rectangular. The pad **1** is preferably formed symmetrically about a transverse center line P-P to bisect a length dimension of the pad **1** as well as about a longitudinal center line Q-Q to bisect a width dimension of the pad **1**. The pad **1** is preferably relatively thick in a central region **6** defined in the vicinity of the transverse center line P-P and gradually thinned toward opposite end regions **7**, **8** in the longitudinal direction A. In that sense, the pad **1** may be designated as a centrally convex pad. The pad **1** may be used together with a suitable undergarment such as a pant or pants, a diaper cover or a diaper.

Referring to FIG. **2**, the absorbent structure **4** includes a bodily fluid absorbent upper component **11** and a bodily fluid absorbent lower component **12** being layered one on another wherein these two absorbent components **11**, **12** are wrapped with respective wrapping sheets **13**. Whilst two wrapping sheets **13***a*, **13***b* are provided there may alternatively be a single wrapping sheet.

The upper absorbent component **11** is a mass or an aggregation of liquid-absorbent materials including liquid-absorbent fibers **21**, such as, fluff wood pulp, semi-synthetic staple fibers such as rayon staple fibers, thermoplastic synthetic staple fibers, thermoplastic synthetic staple fibers having been treated to be hydrophilic, and preferably further includes super-absorbent polymer particles **22**. As viewed in the thickness direction C of the pad **1**, the upper absorbent component **11** preferably has an upper dispersing surface **11***a* and an upper absorbent layer **11***b* directly underlying the upper dispersing surface **11***a*. The upper dispersing surface **11***a* is a laminar portion defining a top surface of the upper absorbent component **11** and is preferably kept in close contact with a first wrapping sheet **13***a* of the wrapping sheets **13**. In the upper dispersing surface **11***a*, the staple fibers and/or the fluff wood pulp as the liquid-absorbent fibers **21** accumulate with these fibers extending along the top surface. The upper absorbent layer **11***b* includes a bottom surface **11***d* of the upper absorbent component **11** and defines a major portion of the upper absorbent component **11** in the thickness direction thereof wherein the bottom surface **11***d* is kept in close contact with the lower absorbent component **12**. In the upper absorbent layer lib, the aforementioned staple fibers and/or fluff wood pulp accumulate but such accumulation has no regularity. It is preferable that the upper dispersing surface **11***a* contains none of the super-absorbent polymer particles **22** and all or at least a majority of the super-absorbent polymer particles **22** in the upper absorbent component **11** are present in the upper absorbent layer **11***b*. Should the upper dispersing surface **11***a* contain the super-absorbent polymer particles **22**, the super-absorbent polymer particles **22** may form a gel block upon absorption of bodily fluid and such gel block will interfere with the absorbing function expected for the absorbent structure **4**.

The lower absorbent component **12** is amass or an aggregation of liquid-absorbent materials including materials similar to the liquid-absorbent fibers **21** described above. As viewed in the thickness direction C of the pad **1**, the lower absorbent component **12** has a lower dispersing surface **12***a* and a lower absorbent layer **12***b* directly underlying the lower dispersing surface **12***a*. The lower dispersing surface **12***a* is a laminar portion defining a top surface of the lower absorbent component **12** and is kept in close contact with the bottom surface **11***d* of the upper absorbent component **11**. In the lower dispersing surface **12***a*, staple fibers and/or fluff wood pulp forming the liquid-absorbent fibers **21** accumulate with the staple fibers and/or the fluff wood pulp extending along the top surface. The lower absorbent layer **12***b* defines a major portion of the lower absorbent component **12** in the thickness direction thereof and is preferably kept in close contact with a second wrapping sheet **13***b* of the wrapping sheets **13**. In the lower absorbent layer **12***b*, the aforementioned staple fibers and/or fluff wood pulp accumulate on an irregular basis. It is preferable that the lower dispersing surface **12***a* does not contain the super-absorbent polymer particles **22** and all or at least a majority of the super-absorbent polymer particles **22** in the lower absorbent component **12** are present in the lower absorbent layer **12***b*. Should the lower dispersing surface **12***a* contain the super-absorbent polymer particles **22**, the super-absorbent polymer particles **22** may form a gel block upon absorption of bodily fluid and such gel block may interfere with a smooth flow of bodily fluid from the upper absorbent component **11** toward the lower absorbent component **12**.

The upper and lower absorbent components **11**, **12** layered one on another are wrapped with the first (upper) and second (lower) wrapping sheets **13***a*, **13***b*. The first wrapping sheet **13***a* of the wrapping sheets **13** kept in close contact with the upper absorbent component **11** is liquid-pervious. The lower absorbent layer **12***b* of the lower absorbent component **12** is kept in close contact with the second wrapping sheet **13***b*. The second wrapping sheet **13***b* is preferably liquid-pervious or partially liquid-impervious. As the liquid-pervious first and second wrapping sheets **13***a*, **13***b*, for example, tissue paper, liquid-pervious nonwoven fabrics or liquid-pervious perforated plastic films may be used. As the liquid-impervious second wrapping sheet **13***b*, for example, liquid-impervious plastic films or liquid-impervious nonwoven fabrics may be used. When the second wrapping sheet **13***b* is liquid-impervious, a liquid-pervious sheet may preferably be used as the backsheet **3**. Referring to FIG. **2**, hot melt adhesives, or otherwise, may be used for bonding between the topsheet **2** and the first wrapping sheet **13***a*, between the first wrapping sheet **13***a* and the upper absorbent component **11**, between the lower absorbent component **12** and the second wrapping sheet **13***b*, and between the second wrapping sheet **13***b* and the backsheet **3**. It should be appreciated, however, that FIG. **2** exemplarily illustrates the case in which such adhesives are not used.

FIG. **3** is a sectional view of the pad **1** taken along line III-III in FIG. **1** wherein the line III-III corresponds to the longitudinal center line Q-Q. Referring to FIG. **3**, the upper absorbent component **11** preferably includes a first upper section **31** lying in the central region **6** of the pad **1** and having a substantially uniform thickness and second and third upper sections **32**, **33** lying in opposite end regions **7**, **8** of the pad **1** and having a relatively smaller thickness. The thickness of the pad **1** is preferably gradually reduced from the first upper section **31** toward the second upper section **32** and the third upper section **33** to define intermediate upper sections **34**, **35**. These first, second and third upper sections **31**, **32**, **33** and the intermediate upper sections **34**, **35** are formed as a whole with the upper dispersing surface **11***a* and the upper absorbent layer **11***b*. The first upper section **31** is located in the central region of the upper absorbent component **11** as viewed in the longitudinal direction A and the second and third upper sections **32**, **33** are located in the end sections of the upper absorbent component **11** opposed to each other in the longitudinal direction A about the first upper section **31**.

The lower absorbent component **12** preferably includes a first lower section **41** lying in the central region **6** of the pad **1** and having a substantially uniform thickness and second and third lower sections **42**, **43** lying in opposite end regions **7**, **8** of the pad **1** and having a relatively smaller thickness. The thickness of the pad **1** is preferably gradually reduced from the first lower section **41** toward the second lower section **42** and the third lower section **43** to define intermediate lower sections **44**, **45**. These first, second and third lower sections **41**, **42**, **43** and the intermediate lower sections **44**, **45** are formed as a whole with the lower dispersing surface **12***a* and the lower absorbent layer **12***b*. The first lower section **41** is located in the central region of the lower absorbent component **12** as viewed in the longitudinal direction A and the second and third lower sections **42**, **43** are located in the end sections of the lower absorbent component **12** opposed to each other in the longitudinal direction A about the first lower section **41**.

Referring to FIG. **3** with FIG. **2**, the upper absorbent component **11** and the lower absorbent component **12** respectively have widths W_1, W_2 (See FIG. **2**) as measured along the transverse center line P-P and lengths L_1, M_1 (See FIG. **3**) as measured along the longitudinal center line Q-Q. The first upper section **31** of the upper absorbent component **11** and the first lower section **41** of the lower absorbent component **12** both lying in the central region **6** of the pad **1** respectively have lengths L_2, M_2 as measured along the longitudinal center line Q-Q. These dimensions may be appropriately selected depending on a wearer's age span and, in the case of the pad **1** for adult, for example, the width W_1 of the upper absorbent component **11** may be set to a range of 40 to 100 mm, the length L_2 may be set to a range of 200 to 300 mm and the length L_2 may be set to a range of 40 to 80% of the length L_1. While the width W_2 of the lower absorbent component **12** may be set to the same dimension as the width W_1 as in the present embodiment, it is possible to set the width W_2 to a dimension which is narrower than or equal to the width W_1. While the length M_1 of the lower absorbent component **12** may be the same as the length L_1 as in the present embodiment, it is also possible, for example, to set the length M_1 to be longer than the length L_1 by a range of 20 to 40 mm so that the thickness of the pad **1** may be gradually changed in the regions between the central region **6** and the end regions **7**, **8** of the pad **1** with the upper absorbent component **11** layered on the lower absorbent component **12** as illustrated in FIG. **3**.

In one embodiment of the pad **1**, the first upper section **31** and the first lower section **41** respectively contain the liquid-absorbent fibers **21** in a range of 300 to 400 g/m^2 by mass and the second and third upper sections **32**, **33** as well as the second and third lower sections **42**, **43** respectively contain the liquid-absorbent fibers in a range of 100 to 250 g/m^2 by mass. When the upper absorbent component **11** and the lower absorbent component **12** respectively contain the super-absorbent polymer particles **22**, content percentage of the super-absorbent polymer particles **22** in the respective absorbent components **11**, **12** is preferably in a range of 35 to 75% by mass.

One example of the method to measure the content percentages of the super-absorbent polymer particles **22** in the upper absorbent component **11** and the lower absorbent component **12** includes the steps as follows: cutting away test pieces each having a size of 20×20 mm from the respective absorbent components **11**, **12**; weighing these test pieces; loosening these test pieces; separating the super-absorbent polymer particles **22** from the liquid-absorbent fibers **21** while these loosened test pieces are observed through a hand glass lens of 5 to 10 magnifications; weighing the liquid-absorbent fibers **21** and the super-absorbent polymer particles **22**; and calculating content percentages of the super-absorbent polymer particles **22** in the upper absorbent component **11** and the lower absorbent component **12**.

Another example of the method to measure the content percentages of the super-absorbent polymer particles **22** includes the steps as follows:

(1) The upper absorbent component **11** or the lower absorbent component **12** to be measured with respect to the content percentage of the super-absorbent polymer particles **22** contained therein is loosened to separate the super-absorbent polymer particles **22** from the liquid-absorbent fibers **21**. Then about 1 g of the liquid-absorbent fibers **21** and about 1 g of the super-absorbent polymer particles **22** are sampled and weighed to obtain a dry mass of the liquid-absorbent fibers **21** and a dry mass of the super-absorbent polymer particles **22**.

(2) The sampled liquid-absorbent fibers **21** and the super-absorbent polymer particles **22** are respectively put into separate 250-mesh nylon envelopes and immersed in 500 ml of physiologic saline for 30 minutes.

(3) The respective nylon envelopes are suspended in a standard testing condition in a testing laboratory room for 15 minutes to drain off water and then weighed to obtain a mass R_P of the nylon envelope containing therein the liquid-absorbent fibers **21** and a mass R_S of the nylon envelope containing therein the super-absorbent polymer particles **22**. A water absorption rate Q_P of the liquid-absorbent fibers **21** and a water absorption rate Q_S of the super-absorbent polymer particles **22** are calculated from following equations:

Water absorption rate Q_P (g/g) of the liquid-absorbent fiber={mass R_P−(mass of nylon envelope)−(dry mass of the liquid-absorbent fibers 21)}/(dry mass of the liquid-absorbent fibers 21).

Water absorption rate Q_S (g/g) of the super-absorbent polymer particles 22={mass R_S−(mass of nylon envelope)−(dry mass of the super-absorbent polymer particles 22)}/(dry mass of the super-absorbent polymer particles 22).

(4) Now a 30 mm×30 mm test piece for measurement is cut away from the upper absorbent component **11** or the lower absorbent component **12** and weighed to obtain a dry mass W_O. A dry mass of the liquid-absorbent fibers **21** contained in this test piece is designated by W_P and a dry mass of the super-absorbent polymer particles **22** contained in this test piece is designated by W_S.

(5) The test piece is put into 250 mesh nylon envelope and the nylon envelope is immersed in 500 ml of physiologic saline for 30 minutes and thereafter the nylon envelope is suspended in a standard testing condition in a testing laboratory room for 15 minutes to drain off water. This drained off envelope is weighed to obtain a wet mass W_1 of this wet test piece. From the dry mass W_O and the wet mass W_1, an amount of water absorption T_A (g) is determined and then dry masses W_P, W_S of the liquid-absorbent fibers **21** and the super-absorbent polymer particles **22** are calculated from the following Math. 1:

$$W_C{}^* = W_P + W_S$$

$$T_A{}^* = W_1{}^* - W_O{}^*$$

$$T_A{}^* = Q_P{}^* \cdot W_P + Q_S{}^* \cdot W_S = Q_P{}^* W_P + Q_S{}^* (W_C{}^* - W_P) = (Q_P{}^* - Q_S{}^*) \cdot W_P + Q_S{}^* \cdot W_O{}^*$$

$$W_P = (T_A{}^* - Q_S{}^* \cdot W_C{}^*)/(Q_P{}^* - Q_S{}^*)$$

$$W_S = W_O{}^* - \{(T_A{}^* - Q_S{}^* \cdot W_O{}^*)/(Q_P{}^* - Q_S{}^*)\} \quad \text{\{Math. 1\}}$$

The above-mentioned procedure makes it possible to determine the content percentage (%) of the super-absorbent polymer particles **22** in the form of Math. 2.

$$(W_S/W_O{}^*) \cdot 100 \quad \text{\{Math. 2\}}$$

The "*" marked values in the abovementioned equations should be understood to be the values which can be directly obtained by measuring the test piece. The method of measuring the content percentage of the super-absorbent polymer particles **22** in this manner is preferably applied to the upper absorbent component and the lower absorbent component **12** in which the liquid-absorbent fibers **21** and the super-absorbent polymer particles **22** are integrated together so that these fiber **21** and particles **22** are not readily separated one from another.

Referring to FIG. **4**, the pad **1** shown therein is distinguished from the pad **1** shown in FIGS. **2** and **3** in a dimensional relation between the upper absorbent component **11** and the lower absorbent component **12** in the longitudinal direction A of the pad **1**. Specifically, the length L_1 of the upper absorbent component **11** is larger than the length M_1 of the lower absorbent component **12**. The length L_2 of the first upper section **31** in the upper absorbent component **11** is larger than the length M_2 of the first lower section **41** in the lower absorbent component **12** and smaller than the length M_1 of the lower absorbent component **12**. Also in the pad **1** shown in FIG. **4**, the thickness of the pad **1** preferably undergoes a gradual change between the central region **6** and the end region **7** as well as between the central region **6** and the end region **8**. Compared, for example, to the case in which the thickness of the lower absorbent component **12** sharply changes, an area over which the upper absorbent component **11** and the lower absorbent component **12** stack one on another can be increased and thereby the possibility that a gap might be left between these components **11**, **12** can be restricted. In such pad **1**, the end regions **7**, **8** and the vicinities thereof can provide supple texture.

Referring to FIG. **5**, a process of making the pad **1**, specifically a process of forming the upper absorbent component **11** and the lower absorbent component **12** in FIG. **4** is illustrated.

In a step I of the process, a sheet-like first web **201** is continuously fed from the upstream side toward the downstream side in a machine direction MD. The first web **201** is material for the second wrapping sheet **13***b* in FIGS. **2** through **4** and runs below a first forming drum **202**. The first forming drum **202** is formed on its peripheral surface with a plurality of shaping depressions **203** each having a shape corresponding to the shape of the lower absorbent component **12** in FIG. **4** and these depressions **203** are arranged intermittently in a circumferential direction of the first forming drum **202**. Each of the depressions **203** includes a relatively deep first depression **241** adapted to form the first lower section **41** of the lower absorbent component **12** and relatively shallow second and third depressions **242**, **243** adapted to form the second and third lower sections **42**, **43**. The first forming drum **202** rotates clockwise (i.e., in the direction D as indicated in FIG. **5**) and the depression **203** is aligned with a feeding unit **204** provided above the first forming drum **202** as the depression **203** comes close to twelve o'clock position. While the feeding unit **204** feeds the liquid-absorbent fibers **21** (See FIG. **4**) preferably containing at least fluff wood pulp downward into the depression **203**, a polymer feeder **206** incorporated in the lower position of the feeding unit **204** in the vicinity of the first forming drum **202** feeds the super-absorbent polymer particles **22** (See FIG. **4**) downward into the depression **203** so that the polymer particles may not be contained in the dispersing surface **12***a*. In the course of being supplied with the liquid-absorbent fibers **21** and the super-absorbent polymer particles **22**, the depression **203** is in fluid-communication with a suction unit **207** and the liquid-absorbent fibers **21** are sucked together with the super-absorbent polymer particles **22** into the depression **203** so as to be accumulated therein. Then, the depression **203** having the fibers **21** and the polymer particles **22** accumulated therein leaves the feeding unit **204**. Immediately after the depression **203** has been aligned with the feeding unit **204**, the depression **203** is supplied primarily with a leading quantity of the liquid-absorbent fibers **21** so that the liquid-absorbent fibers **21** may extend just along the smooth surface of the depression **203** thereof under the suction effect S_1. In other words, this leading quantity of the liquid-absorbent fibers **21** accumulate on the surface of the depression **203** so that the fibers **21** may lie flat on the surface of the depression **203**. A follow-on quantity of the liquid-absorbent fibers **21** is successively accumulated in the depression **203** but apt to be oriented at random in the longitudinal direction, in the transverse direction and in the depth direction of the depression **203**. Outside the feeding unit **204**, the liquid-absorbent fibers **21** and the super-absorbent polymer particles **22** accumulated together are separated from the depression **203** to form masses or aggregations substantially in the shape of the lower absorbent component **12** in FIG. **4** and placed on the first web **201**. The masses or aggregations are arranged on the first web **201** intermittently in the machine direction MD and further run in this direction MD. It should be appreciated that, in the step I, it is possible to use any mechanical or pneumatic push-out means in order to separate the masses or aggregations of the liquid-absorbent fibers **21** and the super-absorbent polymer particles **22** accumulated together from the depression **203**.

In a step II of the process illustrated in FIG. **5**, the lower absorbent components **12** running in the machine direction MD together with the first web **201** pass below a second forming drum **208**. The second forming drum **208** is formed on its peripheral surface with a plurality of shaping depressions **209** each having a shape corresponding to the shape of the upper absorbent component **11** in FIG. **4** and these depressions **209** are arranged intermittently in a circumferential direction of the second forming drum **208**. Each of the depressions **209** includes a relatively deep first depression **231** adapted to form the first upper section **31** of the upper absorbent component **11** and relatively shallow second and third depressions **232**, **233** adapted to form the second and third upper sections **32**, **33**. The second forming drum **208** rotates clockwise (i.e., in the direction D as indicated) and the depression **209** is aligned with a feeding unit **211** provided above the second forming drum **208** as the depression **209** comes close to twelve o'clock position. While the feeding unit **211** feeds the liquid-absorbent fibers **21** containing at least fluff wood pulp downward into the depression **209**, a polymer feeder **212** incorporated in the lower position of the feeding unit **211** in the vicinity of the second forming drum **208** feeds the super-absorbent polymer particles **22** downward into the depression **209** so that the polymer particles **22** may not be contained in the dispersing surface **11***a*. In the course of being supplied with the liquid-absorbent fibers **21** and the super-absorbent polymer particles **22**, the depression **209** is in fluid-communication with a suction unit **213** and the liquid-absorbent fibers **21** is sucked together with the super-absorbent polymer particles **22** into the depression **209** so as to be accumulated therein and leaves the feeding unit **211**. Immediately after the depression **209** has been aligned with the feeding unit **211**, the depression **209** is supplied primarily with the liquid-absorbent fibers **21** so that the liquid-absorbent fibers **21** may extend just along the smooth surface of the depression **209** in the longitudinal direction thereof under the suction effect S_2. In other words, the liquid-absorbent fibers **21** accumulate on the surface of the depression **209** so that the fibers **21** may lie down on the surface of the depression **209**. The liquid-absorbent fibers **21** which subsequently accumulate are oriented at random in the longitudinal direction, in the transverse direction and in the depth direction of the depression **209**. Outside the feeding unit **211**, the accumulated liquid-absorbent fibers **21** and super-absorbent polymer particles **22** are separated from the depression **209** to form a mass in the shape of the upper absorbent components **11** in FIG. **4** and layered on the associated lower absorbent components **12** placed on the first web **201**. These upper and lower absorbent components **11**, **12** arranged on the first web **201** further run in the machine direction MD. In a similar fashion to the fibers **21** in the lower absorbent component **12** obtained in the step I, in the upper absorbent components **11** obtained in the step II, the liquid-absorbent fibers **21** accumulate so that the fibers **21** may lie flat on the surface of the depression **209**.

The first web **201** on which the upper absorbent components **11** and the lower absorbent components **12** are placed runs to a step III. In the step III, a sheet-like second web **216** is continuously fed to the upper absorbent components **11** and the lower absorbent components **12** both placed on the first web **201** from above and cooperates with the first web **201** to sandwich the upper absorbent components **11** and the lower absorbent components **12** and thereby to form a composite web **217**. The second web **216** is used to form the first wrapping sheet **13***a* in FIG. **4**. The composite web **217** may be cut by a cutter **218** along lines defined each pair of the adjacent upper absorbent components **11**, **11** to obtain the individual absorbent structure **4** shown in FIG. **4**.

In the absorbent structure **4** obtained by the process illustrated in FIG. **5**, the first, second and third upper sections **31**, **32**, **33** formed by intermediary of the intermediate sections **34**, **35** in the upper absorbent component **11** have respective thickness conforming to shapes as well as depending on depths of the first, second and third depressions **231**, **232**, **233** in the depression **209**. In a similar fashion, each of the first, second and third lower sections **41**, **42**, **43** formed by intermediary of the intermediate sections **44**, **45** in the lower absorbent component **12** has a respective thickness conforming to shapes as well as depending on depths of the first, second and third depressions **241**, **242**, **243** in the depression **203**. Thickness measurement for these sections **31**, **32**, **33**, **41**, **42**, **43** and the absorbent structure was conducted using PEACOCK Digital Thickness Gauge manufactured by OZAKI MFG. CO. LTD. The measurement was carried out by placing a smooth metallic plate on the regions to be measured. It should be appreciated that the device used for this measurement is not limited to the above-mentioned gauge and any other device equivalent to the above-mentioned gauge may be used. As a measuring terminal of the gauge, a metallic disc having a diameter of 20 mm may be used and put in contact with an object to be measured at a contact pressure in a range of 5.0 to 5.5 g/cm^2. Thickness of the metallic disc may be subtracted from a measured result to obtain thickness of each section. In the lower absorbent component **12** obtained in the step I of FIG. **5**, the liquid-absorbent fibers **21** accumulated directly on the surface of the depression **203** defines the lower dispersing surface **12***a* of the lower absorbent component **12** and the liquid-absorbent fibers **21** and the super-absorbent polymer particles **22** having been accumulated in the depression **203** after forming the lower dispersing surface **12***a* defines the lower absorbent layer **12***b*. In the upper absorbent component **11** obtained in the step II, the liquid-absorbent fibers **21** accumulated directly on the surface of the depression **209** defines the upper dispersing surface **11***a* of the upper absorbent component **11** and the liquid-absorbent fibers **21** and the super-absorbent polymer particles **22** having been accumulated in the depression **209** after formation of the upper dispersing surface **11***a* defines the upper absorbent layer **11***b*. The process illustrated in FIG. **5** may be modified so that the absorbent structure **4** is obtained in the step I and/or the step II without feeding the super-absorbent polymer particles **22** and this absorbent structure **4** is used to obtain the pad **1** according to the present invention. It is also possible in the first step I and/or the second step II to use fluff wood pulp, semi-synthetic staple fibers and the like independently or in the form of mixture thereof as the liquid-absorbent fibers **21**.

With the pad **1** as exemplarily shown in FIGS. **1** through **4** comprising the upper absorbent component **11** and the lower absorbent component **12** obtained by the process as has been described above, bodily fluid discharged onto the central region **6** of the pad **1** penetrates the topsheet **2**, then the first wrapping sheet **13***a* and is absorbed by the upper absorbent component **11**. A portion of bodily fluid having been absorbed by the upper absorbent component **11** moves downward and is absorbed by the lower absorbent component **12**. In the pad **1**, the topsheet **2** is preferably adapted to let bodily fluid penetrate locally without allowing bodily fluid to disperse. While it is not essential for the first wrapping sheet **13***a* to disperse bodily fluid, it is preferable to use tissue paper well adapted for dispersion of bodily fluid as the first wrapping sheet **13***a* so that the first wrapping sheet **13***a* disperses bodily fluid having penetrated the topsheet **2** in the longitudinal direction A as well as in the transverse direction B of the pad **1**. The bodily fluid having penetrated the first wrapping sheet **13***a* moves to the upper dispersing surface **11***a* defining the top surface of the upper absorbent component **11**. In the upper dispersing surface **11***a*, the liquid-absorbent fibers **21** having been subjected to the suction effect in the process illustrated in FIG. **5** extend so as to lie on the top surface of the upper absorbent component **11** and therefore bodily fluid is dispersed over the upper dispersing surface **11***a* and simultaneously absorbed by the upper absorbent layer **11***b*. In the lower absorbent component **12** also, the liquid-absorbent fibers **21** having been subjected to the suction effect in the process illustrated in FIG. **5** extend so as to lie on the top surface of the lower absorbent component **12** and therefore bodily fluid moving from the upper absorbent component **11** to the lower absorbent component **12** is dispersed over the lower dispersing surface **12***a* and simultaneously absorbed by the lower absorbent layer **12***b*.

In the upper absorbent layer **11***b* and the lower absorbent layer **12***b* of the absorbent structure **4**, the larger the distance from the respective dispersing surfaces **11***a*, **12***a* in the thickness direction C, the higher the irregularity at which the liquid-absorbent fibers **21** are accumulated and the lower the density of the respective layers **11***b*, **12***b*. Consequently, it may be difficult for bodily fluid to disperse in the respective layers **11***b*, **12***b* in the longitudinal direction A as well as in the transverse direction B. However, bodily fluid can easily disperse in the upper dispersing surface **11***a* and the lower dispersing surface **12***a* in the longitudinal direction A as well as in the transverse direction B and then move to the upper absorbent layer **11***b* and the lower absorbent layer **12***b*. In this way, bodily fluid absorption property of the upper absorbent layer **11***b* and the lower absorbent layer **12***b* is available over a wide range. In the pad **1**, the upper dispersing surface **11***a* and the lower dispersing surface **12***a* function as means for dispersion of bodily fluid and thereby it is possible to prevent bodily fluid from staying in the central region **6**. In consequence, the central region **6** should not force the wearer of the pad **1** to experience an uncomfortable feeling of wetness.

In the centrally convex pad **1** as illustrated, it would not necessarily be easy to utilize most part of the liquid-absorbent fibers **21** effectively for absorption of bodily fluid. However, the absorbent structure **4** according to the present embodiment includes the upper dispersing surface **11***a* and the lower dispersing surface **12***a* both adapted to disperse bodily fluid and thereby makes it possible to utilize most part of the liquid-absorbent fibers **21**. This means that a large quantity of bodily fluid can be absorbed by the pad **1** and such pad **1** not only alleviates a feeling of wetness experienced by the wearer but also restricts leakage of bodily fluid.

In the pad **1**, the upper absorbent component **11** is preferably in close contact with the lower absorbent component **12** but sometimes gaps **40** (See FIG. **3**) may be left between these absorbent components **11**, **12** and such gaps **40** would often prevent bodily fluid from smoothly moving from the upper absorbent component **11** to the lower absorbent component **12**. However, as exemplarily shown in FIG. **3**, the lower dispersing surface **12***a* extends across and beyond the respective gaps **40** in the longitudinal direction A so that bodily fluid discharged onto the central region **6** of the pad **1** may disperse over the lower dispersing surface **12***a* to the second upper section **32** of the upper absorbent component **11** as well as to the second lower section **42** of the lower absorbent component **12** both being at a large distance from the respective gaps **40** and be absorbed therein.

While the pad **1** comprising the upper absorbent component **11** and the lower absorbent component **12** preferably includes the upper dispersing surface **11***a* and the lower dispersing surface **12***a*, the lower dispersing surface **12***a* lying in a middle of the absorbent structure as viewed in the thickness direction C is particularly important for effective utilization of the lower absorbent layer **12***b*. The lower dispersing surface **12***a* is formed of the liquid-absorbent fibers **21** accumulated at a density higher than a density of the upper absorbent layer **11***b* lying immediately above the lower dispersing surface **12***a* as well as than a density of the lower absorbent layer **12***b* underlying the lower dispersing surface **12***a*. In addition, the lower dispersing surface **12***a* is formed of the liquid-absorbent fibers **21** accumulated on the surface of the depression **203** of the first forming drum **202** so as to extend in parallel to the surface thereof or on the surface of the depression **209** of the second forming drum **208** so as to extend along the surface thereof. In consequence, bodily fluid can disperse over the lower dispersing surface **12***a* at a high velocity in the longitudinal direction A and/or in the transverse direction B and quickly move to the lower absorbent layer **12***b*. Even the upper absorbent component **11** not having the upper dispersing surface **11***a* can be used as the component **11** of the pad **1** so far as the lower dispersing surface **12***a* exhibits the significant function as has been described above.

The dispersion velocity of bodily fluid in the upper absorbent component **11** and/or the lower absorbent component **12** can be visually determined by cutting the pad **1** using a sharp-edge tool and thereby making a test piece allowing a cross-section of the pad **1** in the thickness direction C to be observed. About 1 to 5 ml of test liquid such as artificial urine, artificial menstrual blood or physiologic saline may be fed drop by drop to the test piece from above the topsheet **2** so that progress of penetration of the test liquid into the pad **1** may be visually observed.

The present invention is not limited to the pad **1** including the absorbent structure **4** which includes, in turn, the upper absorbent component **11** and the lower absorbent component **12**, as illustrated, but may be implemented in the form of the pad **1** using a panel-like additional absorbent component placed above the upper absorbent component **11** or in the form of the pad **1** using a panel-like additional absorbent component under the lower absorbent component **12**. The upper absorbent component above which the additional absorbent component is placed preferably includes the upper dispersing surface **11***a*. When the additional absorbent component underlies the lower absorbent component **12**, this additional absorbent component preferably includes a dispersing surface kept in contact with the lower absorbent component **12**. While the exemplarily illustrated pad **1** is centrally convex in the central region **6** defined between the end regions **7**, **8** as viewed in the longitudinal direction A, the pad **1** may be implemented also so that it is centrally convex in the central region defined between the lateral regions as viewed in the transverse direction B.

Furthermore, the present invention is not limited to the urine absorbent pad **1**, and may be implemented also in the form of a bodily fluid absorbent wearing article such as a disposable diaper or a sanitary napkin or in the form of a bodily fluid absorbent member adapted to be attached to a disposable diaper, a diaper cover or the like.

FIG. **6** is a view similar to FIG. **1**, showing another embodiment of the present invention. Referring to FIG. **6**, the pad **1** exemplarily illustrated therein is formed along opposite side edges as viewed in the transverse direction B with compressed regions **81**. These compressed regions **81** may be formed by locally compressing the side edges of the pad **1** of FIG. **1** in the direction from the topsheet **2** toward the backsheet **3**. A mold used for such compression may be used at a room temperature or in a heated state and a temperature at which the mold is heated is preferably selected so that the thermoplastic synthetic resin ingredient is softened but not fused. In the compressed regions **81**, the accumulation of the liquid-absorbent fibers **21** can be densified in comparison to the remaining region. The compressed regions **81** may be shaped in grooves extending continuously or, as exemplarily illustrated, intermittently in the longitudinal direction A along the side edges of the pad **1** to assure that bodily fluid can be dispersed in the longitudinal direction A of the pad **1** before bodily fluid flowing on the topsheet **2** in the transverse direction B of the pad **1** reaches opposite side edges **82** of the pad **1**. In this way, it is possible to prevent bodily fluid from leaking beyond these side edges **82** of the pad **1**. The upper absorbent component **11** and the lower absorbent component **12** overlapping the compressed regions **81** may be put in close contact with the compressed regions **81** to prevent these two absorbent components **11**, **12** from being displaced from each other.

Referring to FIG. **7**, while the pad **1** shown therein also includes the absorbent structure **4** comprising the upper absorbent component **11** and the lower absorbent component **12**, the upper absorbent component **11** does not have the upper dispersing surface **11***a* kept in contact with the first wrapping sheet **13***a* as shown in FIG. **3** but rather an upper dispersing surface **11***c* is kept in contact with the lower absorbent component **12**. The lower surface **12***a* of the lower absorbent component **12** is not kept in contact with the upper absorbent layer **11***b* of the upper absorbent component **11** but rather a lower dispersing surface **12***c* is kept in contact with the second wrapping sheet **13***b*.

The absorbent structure **4** of FIG. **7** can be obtained by making several alterations to the process of FIG. **5**. In the absorbent structure **4** of FIG. **7**, the first web **201** in FIG. **5** is used as stock material for the first wrapping sheet **13***b* and the second web **216** is used as stock material for the second wrapping sheet **13***b*. Of the respective absorbent components in FIG. **5**, the lower absorbent component **12** in FIG. **5** is used as the upper absorbent component **11** in FIG. **7** and the upper absorbent component **11** in FIG. **5** is used as the lower absorbent component **12** in FIG. **7**. Furthermore, the length of the depression **203** in the circumferential direction of the first forming drum **202** in FIG. **5** is changed to the length of the depression **209** in the circumferential direction of the second forming drum **208** in FIG. **5** and the length of the depression **209** in the circumferential direction of the second forming drum **208** in FIG. **5** is changed to the length of the depression **203** in the circumferential direction of the first forming drum **202** in FIG. **5**. In the pad **1** of FIG. **7**, the bodily fluid disperses over the upper dispersing surface **11***c* in the longitudinal direction A and/or in the transverse direction B at the higher velocity than in the upper absorbent layer **11***b* lying immediately above the upper dispersing surface **11***c* and the lower absorbent layer **12***b* immediately underlying the upper dispersing surface **11***c*. In consequence, bodily fluid moving down in the thickness direction C rapidly disperses over the upper dispersing surface **11***c* in the longitudinal direction A and/or in the transverse direction B and simultaneously moves into the lower absorbent layer **12***b* of the lower absorbent component **12** over a wide range.

Referring to FIG. **8**, the pad **1** shown therein is distinguished from the pad **1** of FIG. **1** in that the pad **1** is formed in the middle as viewed in the transverse direction B of the pad **1** with a plurality of compressed regions **100** arranged intermittently in the longitudinal direction A. These compressed regions **100** may be formed by the same method as has been used to form the compressed regions **81** in FIG. **6**, i.e., by locally compressing the pad **1** of FIG. **1** in the direction from the topsheet **2** toward the backsheet **3** (See FIGS. **1** and **2**). In FIG. **8**, each of the compressed regions **100** has a rectangular or square bottom surface **101** contoured by a dimensions a and b in the longitudinal direction A and in the transverse direction B, respectively, and each pair of the compressed regions **100**, **100** being adjacent in the longitudinal direction A are spaced from each other by a dimension c. While these dimensions a, b, c may be set to appropriate values depending on a size of the pad **1** or the other factors, the case in which the dimensiona is equal to the dimension b, i.e., the individual compressed region is square, and the dimension c is constant is exemplarily illustrated. The compressed regions **100** are surrounded by a non-compressed region **102** and this non-compressed region **102** includes intermediate regions **103** extending between each pair of the adjacent compressed regions **100** and having a dimension c.

Referring to FIG. **9**, in each of the compressed regions **100**, the liquid-absorbent fibers **21** (See FIG. **2**) contained in the upper and lower absorbent components **11**, **12** are accumulated at a relatively high density and, in the non-compressed region **102**, the liquid-absorbent fibers **21** are accumulated at a relatively low density. It should be noted here that, in the intermediate regions **103** in the non-compressed region **102** each defined between each pair of the adjacent compressed regions **100**, the liquid-absorbent fibers **21** are accumulated at a higher density than that in the non-compressed region **102** other than the intermediate regions **103**. This is because these intermediate regions **103** are more or less influenced by formation of the compressed regions **100**. In other words, with regard to the state of accumulation of the liquid-absorbent fibers **21**, there are formed high density accumulation regions in the compressed regions **100**, middle density accumulation regions in the intermediate regions **103** and low density accumulation regions in the non-compressed region **102** other than the intermediate regions **103**. Of the non-compressed region **102**, a region adjacent to the side of the four sides contouring the bottom surface **101** of the compressed region **100** is also influenced by formation of the compressed region **100**. In the description given hereunder, it should be appreciated that such region is not included in the term "the non-compressed region **102**".

In FIG. **9**, the bottom surface **101** of the compressed region **100** lies at a lower level than a surface level **105** of the non-compressed region **102** exclusive of the intermediate region **103** by the dimension D. In other words, the distance between the bottom surface **101** and the backsheet **3** is smaller than the distance between the surface level **105** and the backsheet **3**. The dimension D substantially corresponds to the depth of compression worked on the pad **1**. The dimension D in the pad **1** may be varied to vary the density of the compressed regions **100** in which the liquid-absorbent fibers **21** are accumulated. The term "density of the compressed region" used herein means the density of the absorbent structure **4** included by the compressed region.

Concerning the super-absorbent polymer particles **22** (See FIG. **2**), it depends on the situation whether the super-absorbent polymer particles **22** are contained or not.

In FIG. **9**, suffixes **1** through **5** are attached the dimensions D of the respective compressed regions **100** arranged from the transverse center line P-P toward the end region **7**. Of these dimensions D_1 through D_5, the dimension D_1, the dimension D_2 and the dimension D_3 are gradually enlarged in this order and the dimensions D_3 through D_5 are equal one to another. The compressed regions **100** having the dimensions D_1 through D_3 are formed in the central region **6** in which the non-compressed region **102** is relatively thick and substantially uniform. The compressed region **100** having the dimension D_4 is formed in the intermediate region **6***a* extending between the central region **6** and the end region **7** or **8** and being relatively thin. The compressed region **100** having the dimension D_5 is formed in the end region **7** or **8** which is thinner than the intermediate region **6***a*. In the pad **1** having the dimension in the longitudinal direction A and the thickness varying in this manner, the density of the compressed regions **100** containing the accumulated liquid-absorbent fibers **21** exhibits the density gradient according to which the density of the compressed regions **100** gradually increases from the transverse center line P-P to the end region **7**. In the pad **1**, also formed is the density gradient according to which the density of the compressed regions **100** gradually increases from the transverse center line P-P to the end region **8**.

FIG. **9** exemplarily shows the density gradient exhibited by the compressed regions **100** respectively having the dimensions D_1 through D_3 and a substantially uniform thickness and the density gradient exhibited by the compressed regions **100** having the dimensions D_3 through D_5 and gradually reduced thickness. With either density gradient, bodily fluid disperses toward the compressed regions **100** having a relatively high density.

With such pad **1**, bodily fluid such as urine discharged, for example, onto a region in which the transverse center line P-P intersects with the longitudinal center line Q-Q quickly disperses from the transverse center line P-P toward the end region **7** and/or the end region **8** according to the density gradients defined among the compressed regions **100** and is absorbed and contained by the end regions **7**, **8** and the other regions. In this pad **1**, the compressed regions **100** function as the means adapted for dispersion of bodily fluid whether the dispersing surfaces **11***a*, **12***a* are present or not in the absorbent structure **4** and the end regions **7**, **8** and the other regions of the pad **1** can be utilized for absorption and containment of bodily fluid.

In the pad **1** exemplarily shown in FIGS. **8** and **9**, it is possible to vary the dimension a of the compressed regions **100** so that, the closer to the end region **7** and/or the end region **8**, the larger the dimension a is. With the pad **1** constructed in this manner, the closer to the end region **7** and/or the end region **8**, the longer the bottom surface of the compressed region **100** in the longitudinal direction A. Consequentially, bodily fluid can smoothly disperse from the central region as viewed in the longitudinal direction A toward the end region **7** and/or the end region **8**.

In the pad **1** exemplarily shown in FIGS. **8** and **9**, with the dimension a being kept constant, the dimension b can be varied so that, closer to the end region **7** and/or the end region **8**, larger the dimension b is. With the pad **1** constructed in this manner, closer to the end region **7** and/or the end region **8**, the bottom surface **101** of the compressed regions **100** is wider and the area of the bottom surface **101** is larger. In consequence, bodily fluid discharged onto the central region as viewed in the longitudinal direction A can smoothly disperse in the longitudinal direction A as well as in the transverse direction B.

It is also possible in the pad **1** to vary the dimension a and the dimension b so that, the closer to the end region **7** and/or the end region **8**, the larger the dimensions a and b are. The dimension c is preferably small so far as the dimension c does not interfere with formation of the compressed regions **100**.

Referring to FIG. **10**, it is a view similar to FIG. **8**, showing further another embodiment of the present invention. However, the pad **1** shown in FIG. **10** is different from pad **1** shown in FIG. **8** in that, in addition to that the compressed regions **100** are aligned intermittently along the longitudinal center line Q-Q, additional compressed regions **100***a* are aligned in the transverse direction B in the end regions **7**, and/or additional compressed regions **100***b* are aligned in the transverse direction B in the end regions **8**. The additional compressed regions **100***a* are formed in the same manner as the compressed region **100** in the end region **7** and the additional compressed regions **100***b* are formed in the same manner as the compressed region **100** in the end region **8**. By forming these additional compressed regions **100***a*, **100***b* as exemplarily illustrated, dispersion of bodily fluid over the end regions **7**, **8** in the transverse direction B is facilitated and the end regions **7**, **8** can be utilized over a wide range for absorption and containment of bodily fluid.

Referring to FIG. **11**, it is a view similar to FIG. **9**, showing an alternative embodiment of the present invention. The absorbent structure **4** of the pad **1** shown in FIG. **11** does not include the upper absorbent component **11** and the lower absorbent component **12** layered one on another as exemplarily shown in FIG. **3**. Specifically, the absorbent structure **4** according to the present embodiment includes amass or an aggregation of absorbent materials having the same composition as the upper absorbent component **11** or the lower absorbent component **12** but not having the laminar structure and wrapped with the wrapping sheet **13** exemplarily shown in FIG. **3**. Also in the pad **1** having such absorbent structure **4**, the compressed regions **100** exemplarily illustrated in FIGS. **8** through **10** may be formed to obtain the bodily fluid absorbent article according to the present invention.

While the pad **1** is shown in FIGS. **1** through **11** to be rectangular, the shape of the pad **1** may be appropriately selected depending on the intended purpose. The shapes of the compressed regions **81**, **100** are not limited to the rectangle and square but may be appropriately selected. It is possible to form the compressed region **100** by compressing the pad **1** from the side of the backsheet **3** toward the side of the topsheet **2** instead of compressing the pad **1** from the side of the topsheet **2** toward the backsheet **3**. It is also possible in the pad **1** of FIG. **6** to replace the rows of the compressed regions **81** in the pad **1** of FIG. **6** by the compressed regions **100** exemplarily shown in FIGS. **8** and **9** and thereby to obtain the bodily fluid absorbent article according to the present invention.

Any of the arrangements of compressed regions, as discussed with respect to FIGS. **6** and **8** to **11** may be provided in the embodiments of FIGS. **1** to **4**. Moreover, the absorbent structures, as discussed with respect to FIGS. **3**, **4** and **7** may be swapped with one another. Various further embodiments will be realized by those skilled in the art by the combination of various features from the different embodiments within the scope of the claims.

The first, second and third aspects of the present invention described above may be arranged in at least the following features:

There is provided a bodily fluid absorbent article having a longitudinal direction and a thickness direction and comprising a liquid-pervious topsheet, a liquid-pervious or liquid-impervious backsheet and an absorbent structure sandwiched between the top- and backsheets in this order as viewed in the thickness direction. The absorbent structure includes a mass or an aggregation of liquid-absorbent materials at least including liquid-absorbent fibers, and wrapped with a wrapping sheet and a dispersing surface facilitating bodily fluid to be dispersed, and wherein at least a portion of the wrapping sheet located above as viewed in the thickness direction is liquid-pervious.

The first aspect further includes the absorbent structure including an upper absorbent component and a lower absorbent component both lying inside the one or more wrapping sheets and layered one on another in the thickness direction and the dispersing surface includes a surface of the upper absorbent component which is kept in contact with the lower absorbent component or a surface of the lower absorbent component which is kept in contact with the upper absorbent component; and the liquid-absorbent fibers in the dispersing surface extend along the dispersing surface. Preferably, the orientation of the liquid-absorbent fibers in the longitudinal direction or the transverse direction, respectively, is higher in the dispersing surface than in a region of the respective absorbent component contacting the dispersing surface.

The first aspect may include at least the following embodiments.

(i) Both the upper absorbent component and the lower absorbent components may include dispersing surfaces, wherein the dispersing surface of the upper absorbent component is kept in contact with the wrapping sheet and the dispersing surface of the lower absorbent component is kept in contact with the upper absorbent component.

Alternatively, both the upper absorbent component and the lower absorbent components may include dispersing surfaces, wherein the dispersing surface of the upper absorbent component is kept in contact with the lower absorbent component and the dispersing surface of the lower absorbent component is kept in contact with the wrapping sheet.

(ii) Either or both absorbent components that are provided with the dispersing surface, wherein the dispersing surface is unitarily formed with the absorbent layer.

(iii) The dispersing surface preferably extends over the entire surface of the absorbent layer.

(iv) The orientation of the liquid-absorbent fibers in the dispersing surface is preferably greater than the orientation of the liquid-absorbent fibers in the absorbent layer.

(v) The orientation of the liquid-absorbent fibers in the absorbent layer preferably decreases as the distance from the dispersing surface in the thickness direction of the absorbent component increases.

(vi) The liquid-absorbent fibers are oriented in the one of the dispersing surface so as to extend in at least one of the longitudinal direction and the transverse direction and thereby the dispersion velocity is improved.

(vii) The density of the liquid-absorbent fibers in the absorbent layer preferably decreases as the distance from the dispersing surface in the thickness direction of the absorbent component increases.

(viii) The upper absorbent component and the lower absorbent component may contain super-absorbent polymer particles and a content percentage by mass of the super-absorbent polymer particles in the upper absorbent component may be lower than that in the lower absorbent component.

(ix) The dispersing surfaces may contain none of the super-absorbent polymer particles.

(x) The upper and lower absorbent components may be the same size in the length and/or width dimensions. Alternatively, either the upper or lower absorbent component may be longer and/or wider than the other of the upper and lower components.

(xi) The topsheet and the wrapping sheet, the wrapping sheet and the upper absorbent component, the lower absorbent component and the wrapping sheet, and the second wrapping sheet and the backsheet may be bonded to one another.

(xii) Both the upper absorbent component and the lower absorbent component may include central sections as viewed in one of the longitudinal direction and the transverse direction, which are dimensioned to be thicker than respective end sections extending outside the central sections as viewed in one of the respective longitudinal and transverse directions.

(xiii) The central sections of the upper and lower absorbent components may be the same size in the length and/or width dimensions. Alternatively, either the central section of the upper absorbent component or the central section of the lower absorbent component may be longer and/or wider than the central section of the other of the upper and lower absorbent components.

(xiv) The central sections of the upper absorbent component and the lower absorbent component may respectively define regions each containing the liquid-absorbent fiber in a range of 300 to 400 g/m^2 by mass and the end sections respectively define regions each containing the liquid-absorbent fiber in a range of 100 to 250 g/m^2 by mass.

(xv) The upper absorbent component and the lower absorbent component may respectively contain the super-absorbent polymer particles in a range of 35 to 75% by mass per unit area. A plurality of compressed regions may be formed by locally compressing the upper and/or lower absorbent component in the thickness direction, wherein the plurality of compressed regions are arranged intermittently in the longitudinal direction of the absorbent article.

(xvi) The compressed regions may have respective areas gradually enlarging from a central region of the bodily fluid absorbent article toward opposite end regions in the longitudinal direction.

(xvii) The compressed regions may have respective densities gradually increasing from a central region of the bodily fluid absorbent article toward opposite end regions in the longitudinal direction.

The second aspect further includes the following features:

The dispersing surface includes a plurality of compressed regions formed by locally compressing the absorbent structure in the thickness direction, the compressed regions being arranged intermittently in the longitudinal direction, and the compressed regions having respective areas gradually enlarging from a central region of the bodily fluid absorbent article toward opposite end regions in the longitudinal direction.

The second aspect may include an absorbent structure in accordance with the first aspect and any of the embodiments thereof, as defined in the preceding paragraphs. The second aspect may further include at least the following embodiments.

(i) A plurality of the compressed regions may be formed in a middle region of the absorbent structure as viewed in the transverse direction. The compressed regions may extend along the longitudinal centerline of the absorbent article.

(ii) A plurality of the compressed regions may be formed on both sides of the absorbent structure as viewed in the transverse direction. The compressed regions may extend along each of the transversely spaced side edges of the absorbent structure.

(iii) The absorbent structure may additionally include in the end regions on both sides of the compressed regions formed in the middle in the transverse direction, with second compressed regions by locally compressing the absorbent structure in the thickness direction.

(iv) The absorbent structure may be formed so that its thickness is gradually reduced from the middle region in the longitudinal direction toward the end regions and the respective densities of the compressed regions arranged in the longitudinal direction gradually increase from the central region in the longitudinal direction toward the end regions.

(v) The absorbent structure may include an upper absorbent component and a lower absorbent component both lying inside the one or more wrapping sheets and stacked one on another in the thickness direction and the compressed regions are formed by compressing the absorbent structure from one of the upper absorbent component and the lower absorbent component toward the other.

The third aspect further includes the dispersing surface including a plurality of compressed regions formed by locally compressing the absorbent component in the thickness direction so as to be arranged intermittently in the longitudinal direction so that the compressed regions having respective densities gradually increasing from a central region of the bodily fluid absorbent article toward opposite end regions in the longitudinal direction.

The third aspect may include an absorbent structure in accordance with the first aspect and any of the embodiments thereof, as defined in the preceding paragraphs. The third aspect may further include at least the following embodiments.

(i) The depth of the compressed regions in the thickness direction may gradually increase from a central region of the bodily fluid absorbent article toward opposite end regions in the longitudinal direction.

(ii) A plurality of the compressed regions may be formed in a middle region of the absorbent structure as viewed in the transverse direction. All or some of the compressed regions may extend along the longitudinal centerline of the absorbent article.

(iii) The size of the compressed regions may remain constant. Alternatively, the compressed regions may have respective areas gradually enlarging from a central region of the bodily fluid absorbent article toward opposite end regions in the longitudinal direction.

(iv) The spacing between the compressed regions may remain constant.

(v) The compressed regions are preferably square.

The first, second and third aspects may include the following embodiment.

The liquid-absorbent fibers may be composed of at least one of fluff wood pulp and fluff wood pulp combined with different liquid-absorbent fibers.

REFERENCE SIGNS LIST

1 bodily fluid absorbent article (urine absorbent pad)
2 topsheet
3 backsheet
4 absorbent structure
7 region (end region)
8 region (end region)
11 upper absorbent component
11*a* dispersing surface (upper dispersing surface)
11*c* dispersing surface (lower dispersing surface)
12 lower absorbent component
12*a* dispersing surface (lower dispersing surface)
12*c* dispersing surface (lower dispersing surface)
13 wrapping sheets
13*a*, **13***b* wrapping sheets (first and second wrapping sheets)
21 liquid-absorbent fibers
22 super-absorbent polymer particles
31 central region (first upper section)
32 end region (second upper section)
33 end region (third upper section)
41 central region (first lower section)
42 end region (second lower section)
43 end region (third lower section)
100 compressed region
100*a* second compressed region
100*b* second compressed region
A longitudinal direction
B transverse direction
C thickness direction

The invention claimed is:

1. A bodily fluid absorbent article having a longitudinal direction and a thickness direction and comprising:

a liquid-pervious topsheet;

a liquid-pervious or liquid-impervious backsheet; and an absorbent structure sandwiched between the top- and backsheets as viewed in the thickness direction,

wherein the absorbent structure comprises a mass or an aggregation of liquid-absorbent materials, at least including liquid-absorbent fibers, wrapped with one or more wrapping sheets, and dispersing surface facilitating bodily fluid to be dispersed, and wherein at least a portion of one of the wrapping sheets located above the absorbent structure as viewed in the thickness direction is liquid-pervious, wherein:

the absorbent structure further comprises an upper absorbent component and a lower absorbent component each comprising a mass or an aggregation of liquid-absorbent materials including at least liquid-absorbent fibers and each lying inside the one or more wrapping sheets and layered one on another in the thickness direction;

a dispersing surface comprising a surface of the upper absorbent component which is kept in contact with the lower absorbent component or a surface of the lower absorbent component which is kept in contact with the upper absorbent component; and

the liquid-absorbent fibers in the dispersing surface extend along the dispersing surface,

wherein both the upper absorbent component and the lower absorbent component include central sections as viewed in one of the longitudinal direction and the transverse direction, which are dimensioned to be thicker than respective end sections extending outside the central sections as viewed in one of the respective longitudinal and transverse directions.

2. The bodily fluid absorbent article defined by claim **1**, wherein the upper absorbent component and the lower absorbent component contain super-absorbent polymer particles and a content percentage by mass of the super-absorbent polymer particles in the upper absorbent component is lower than a content percentage by mass of the super-absorbent polymer particles in the lower absorbent component.

3. The bodily fluid absorbent article defined by claim **2**, wherein the dispersing surfaces contains none of the super-absorbent polymer particles.

4. The bodily fluid absorbent article defined by claim **2**, wherein the upper absorbent component and the lower absorbent component respectively contain the super-absorbent polymer particles in a range of 35 to 75% by mass per unit area.

5. The bodily fluid absorbent article defined by claim **1**, wherein the central sections of the upper absorbent component and the lower absorbent component respectively define regions each containing the liquid-absorbent fibers in a range of 300 to 400 g/m^2 by mass and the end sections respectively define regions each containing the liquid-absorbent fibers in a range of 100 to 250 g/m^2 by mass.

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